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EDITORIALS

IMPROVING ELECTRIC-RANGE WIRING.

Better wiring from supply circuits to electric ranges is a need of present importance, according to Mr. A. L. Smith, Jr., of the Boston Edison Company, who discussed this question at the fall convention of the New England Section of the National Electric Light Association. This matter is very much within the control of central stations, and with a little more co-operation on the part of contractors, improvements can be effected with very little expense. Singularly enough, Mr. Smith stated, the part of the installation that is in a way most important, is the one most neglected, viz., the main-line switch. Both contractors and central stations that do their own wiring are prone to use a jack-knife switch with fuse clips below for main-line fusing, usually mounted within a box of iron permanently grounded. Often the switch box is around the corner from the range, and in many instances the connection to the range is made by leads covered with circular loom or by wires taped into one cable.

Now the kitchen is about the last place in the house where live parts and bare contacts should be exposed, especially on 220-volt circuits. It is entirely within the compass of modern wiring to provide for the safe and convenient installation of range circuits, with some reduction in the size of switches from those often employed. The tendency is for the contractor to install too heavy copper in such work, and specification of the size of wire to be employed is a matter that the central station will do well to look after. A two-per-cent drop in the wiring does not demand the sizes often employed. Thus, a five-kilowatt range located 100 feet away from the service entrance can be handled by a No. 8 wire instead of the No. 6 which might often be installed. Loose or dangling wiring is most objectionable around a kitchen, and the use of permanent wiring, preferably in rigid pipe, flexible conduit or armored cable, with the minimum visibility, is most desirable. Another improvement much needed is the use so far as possible of main-line switches of the snap or rotary type, mounted rigidly in an approved steel box or fitting, and located within sight of and near the range.

With the increasing demand for electric ranges (1,600 or more are now reported to be in use in New England alone), the manufacturer of wiring equipment should turn his attention to the development of special sets of fittings arranged in compact form and suitable for range connections under varied conditions. There is little question that it would pay to develop equipment of this kind, in view of the success now being attained in the design and construction of meter panels for apartment-house service. It makes little difference to the range owner whether the service resulting is temporarily unsatisfactory on account of the wiring between the service entrance and the range or because of some failure to learn how to get the best results in the use of the latter; and the central station will do well in the light of Mr. Smith's suggestions to see to it that it does not lose good business and continued patronage through the failure to provide the range owner with a wiring installation of first quality in every possible case.

BRINGING RESEARCH AND BUSINESS IN CONTACT.

The value of industrial research is gradually coming into fuller recognition in this country. Manufacturers who never before considered this element of development work have established research laboratories and a number of influences have come into action to direct general attention to the benefits to be derived from this course of action. It is also recognized to some extent that even where manufacturers and other business men do not establish facilities of this kind for their own immediate use, advantage can nevertheless be gained by an intimate knowledge of the general advances which are being made by research laboratories of a public character, such as those connected with educational institutions and with some of our government bureaus. The means of keeping the business and industrial world in touch with the activities of the scientists are not, however, of the best, and it is the exception rather than the rule when the one class makes a visit to the haunts of the other or invites a representative of the other to come to a meeting of its own members and give a discussion of the problems which may affect both.

It is consequently of interest to note a new departure which has been instituted in England, where the war has brought about many changes and has opened the eyes of the people of the nation to the necessity of utilizing every avenue of progress toward industrial efficiency. About a month ago, upon the invitation of the universities at Leeds and at Sheffield, a party of journalists visited them and inspected the work which was going on. This party was made up largely of representatives of the scientific, technical and trade press, the object being to keep such journalists informed of the work going on at the universities so that they in turn might bring this information before the manufacturers of the country. A similar visit had previously

been made to the Imperial College of Science in London and it is proposed to extend the practice to reach other educational centers. It is recognized that the technical journals are in a position to provide wide dissemination for such information of what the colleges and universities may be doing as is of interest to manufacturers and other business classes, and that the proper utilization of such channels may bring about a wider appreciation of the benefits of applied science to industry and an earlier application of useful knowledge than would come about were there no such direct channel.

It would seem that the same idea might perhaps be applied with advantage in this country and lead to useful results. There is at present a notable lack of appreciation of the importance of scientific research to industry and our universities are very generally looked upon as purely educational institutions in the narrower sense of the term. Men of science in this country do not have the high public regard which is accorded to their contemporaries in European nations, and the appreciation of the industrial and commercial world might also have the effect of stimulating more productive work in the field of research.

CENTRAL-STATION SERVICE IN ENGLAND IN WAR-TIME.

The war has imparted a new interest to the question, so often discussed in England in the years preceding the outbreak, of the value of the services rendered by assistants, charge engineers, and other similar employees in power stations, and attendants in charge of substations. Though in the early days of central stations, work of this character was greatly sought after on account of the valuable experience to be gained therein, and because such openings were found to be stepping stones to higher positions, the remuneration was low. But as this department of the electrical industry developed, the number of vacancies at the top did not increase sufficiently to afford rosy prospects in the same field for all the juniors who, after a costly education and training, chose to enter it. Men therefore got into a groove, could not secure a liberal compensation, and were accustomed to hearing unflattering remarks concerning the unimportant nature of their work and the little training that was necessary in order to be able to do it.

As was recorded in these pages at the time, their agitation for better recognition and the raising of their status was an outstanding feature of the almost universal unrest which characterized so many departments of industrial life in the year preceding the war. When war broke out very many of them left their humdrum duties to join the fighting forces, and numbers have given up their lives, while others are quite unfitted to return to the same class of work even if they so desire. Those who remained at their station posts, however, as well as others who adopted the calling to fill vacancies, found, as war activities developed and national industries began to play a prominent part in supplying munitions for the armies and the navy, that they had become a far more important body of men than they had been regarded in pre-war days, for industries were dependent upon power, and power stations were dependent upon the men who knew how to keep them running reliably and efficiently.

The government authorities were not long in recognizing this fact and some men had to remain in their occupation against their will in order that electric supply might be given without handicap. But while this testimonial which it was difficult to obtain in normal times gave them a consciousness that they were rendering real service to their nation, it was accompanied by a development which discounted its value, for the scarcity of central-station assistants led those in authority to inquire whether partly trained men, and women too, could not with safety and efficiency fill such positions in times which were exceptional. Indeed women workers are now giving very satisfactory service in such capacities in several stations, while disabled sailors and soldiers, whose fighting service in the war has definitely ended because of a lost limb, or some other defect, are being trained to fill the gaps at remuneration which will not be high, but will be supplemented by army pensions.

Some of the experienced men still in the stations, and others of them who are with the forces, but are keeping themselves informed through their technical journals of the movements that are in progress at home, do not view with the deepest satisfaction and composure the prospect of reduced standing, and standard of remuneration, in central-station life after the war. They further find the military authorities demanding the release of other efficient men of their class from electricity works, especially those under the age of 30, for the purpose of strengthening the fighting forces. One chief engineer has declared that his town will be left without its supply if certain men in question are not left behind, but the military authorities have indicated that engineers of such undertakings must try to secure older men. Naturally the employees are, generally speaking, men well within military age, partly or account of the remuneration paid and the changing character of a personnel which uses this class of work as a means for climbing to some other branch of the industry.

Among the measures which have been developed for providing substitutes is that organized by the Institution of Electrical Engineers in co-operation with the London County Council for giving preliminary training to disabled soldiers and sailors as substation attendants. Not a great deal has yet been done, but as far as things have gone the yield of assistance has been satisfactory. To the course of instruction in the scheme mentioned, 40 men were admitted, and of these 25 have been placed in central stations, the others having either found other situations or been unable to complete the course. The classes are held at the Northampton Polytechnic Institute in London; they are free and the work consists of demonstrations and exercises in the first principles of electrical engineering

and physics, practical work in the electrical and physical laboratories, and demonstrations in the Institute power house. A preliminary course fits a man to commence service as a probationer in a month. In the last week of the course instruction is given to them in substations and generating stations in the London district by those actually in charge there.

LIGHTING AN ART MUSEUM.

An art museum is usually a particular type of building as well as one containing objects which present for their lighting a particular problem. Daylight illumination is desired not only because of those qualities which are generally desirable, but because paintings and other objects of art involve the use of colors which will not be shown in their correct values when lighted by artificial sources not equivalent to daylight. It is a matter of common experience to find picture galleries poorly lighted. Not only is the artificial lighting usually poor in color quality, but both this and daylight are often defective in direction and quantity, and reflections from the glass used in framing the picture are frequently annoying.

We present in this and the next issue a description of the lighting installation of the Cleveland Museum of Art, which is fortunate in having had the services of a committee of men who are familiar with the requirements of good lighting and with the means for attaining them. The result is an installation in which excellent results have been secured. In the painting galleries the artificial lighting approximates to daylight in quality through the use of the so-called "daylight" lamp. Suitable provision has been made for securing the proper intensity and direction of light. Glare and annoying contrasts have been avoided. A choice of glass for the sub-skylights has been made so as to fit them to give the effects desired. Neither clear glass nor a completely diffusing glass was found suitable to meet the conditions which confronted the committee in this building.

Two lessons may be drawn from this article. One is that the lighting of similar buildings can be made much better than has heretofore been attained, providing the attention of qualified engineers is given to the problem. The other is that the lighting problem in buildings of this kind, and indeed in every other, should be fully considered before the designs are completed or construction begun, so that the architectural features may be made to conform to the conditions necessary for good lighting. In a museum of this kind quite as much if not more than in other types of building, good lighting is essential if the purposes of the builders are to be fully carried out, but it is a notorious fact that in the past insufficient consideration has been given to this problem and the results have usually been unsatisfactory. It is to be hoped that in the future, with an example of this kind furnishing evidence of what may be done, we will have a general improvement in the lighting of buildings of this character.

THE COAL FAMINE.

Extremely startling reports of conditions among the public utilities in north central sections, more or less dependent on the Kentucky mining fields for their fuel, were given at the Interstate Commerce Commission hearing in Louisville last week. A multitude of concerns, many of them electric-lighting plants, advised the Commission of absolute failure of their supplies. Mr. Otto Wright, general manager of the municipal lighting plant of Hamilton, O., appeared on Friday, and stated that half of his plant already had been closed and that the rest would also suspend service that night.

Appalling conditions as to the coal-supply service were disclosed by the witnesses who testified. The seriousness of the situation was at once apparent to Commissioner C. C. McChord, who was presiding, and the hearing was made formal, giving the Commission the authority to issue an order at its conclusion.

Commissioner McChord suggested for immediate relief that the railroad representatives present appoint a committee to administer car-service rules. The representatives replied that they were without authority so to bind their roads and recommended other arrangements be made by which relief could be secured.

The effort of the Commission and the shippers, as well as the railroads, is to provide for better supplies of cars so as to insure deliveries. All witnesses expressed themselves as being in favor of increased demurrage charges, so as to expedite loading and unloading of cars.

In Chicago a suit has been instituted in the federal court to secure an injunction against certain railroads which are accused of loading coal cars with other materials and sending them into other territory, instead of returning them to the point of origin. The suit was instituted by 26 coal companies, which charge that this practice is responsible for the car shortage and the high price of coal.

The coal shortage is one of the uppermost questions in the minds of central-station managements and, also, of industrial plants, which are operating more or less on a precarious hand-to-mouth basis. It is natural that large central stations should obtain the best service possible, because, being public service corporations, it is reasonable to expect that preferential service could be demanded. Many of the smaller plants are having a desperate time keeping in supplies. Incidentally numbers have decided that after this their contracts will run from June to June, and not expire in October.

With coal short and prices unprecedented, it is not necessary to state that concerns operating on central-station power have a marked advantage over those dependent on the coal supply. Several days ago a large manufacturing establishment was compelled to operate for several hours on wood waste in an endeavor to keep up steam, before the famine was relieved by delivery of a car. This is another feature of the uncertainties of steam power and forms a strong talking point for the salesmen of central-station power, who are not slow to make the most of it.

Happenings in the Industry

Boston Edison Company Will Increase Its Capacity by 120,000 Kilowatts—Public Relations Outlined by New England Committee—Committees of Fixture Manufacturers Appointed—Commission May Order Reasonable Improvements—Utility Must Serve Customers Not On Lines—British Government Urged to Admit American Electrics

BOSTON EDISON COMPANY PLANS EXTENSIVE IMPROVEMENTS.

Addition of 120,000-Kilowatt Equipment Being Made to Principal Generating Plant.

In the report of the directors of the Edison Electric Illuminating Company of Boston to the stockholders at their thirty-first annual meeting October 10, President Edgar called attention to extensions now being made and yet to be made in the L Street generating station. This principal station, originally designed to be composed of three sections with separate installations, has been completed with respect to the first two sections which contain eight vertical General Electric turbines of a total capacity of 96,000 kilowatts.

The third section has already been begun and will have a turbine and a boiler room much larger than those of the first two sections. There will be an ultimate installation of four 30,000-kilowatt units, an order having already been placed with the General Electric Company for one of the turbines, which is to be in operation by next summer. Coal-handling facilities are to be greatly increased.

Among the important undertakings of the past year are a connecting transmission line from the Sudbury dam of the Metropolitan Water Works to the company's system; new lines from L Street to Somerville and Congress Street substations; submarine tunnels under two arms of the harbor; the commencement of the Dorchester substation and the installation of much new apparatus in the Stuart Street, Chatham Street and Congress Street substations.

The policy of postponing expenditures for new construction on account of the European war was followed early in the year, but the very large increase in prospective new business made it desirable to revert to the old policy of making extensions wherever the income warranted. Hence, new work far exceeded that for 1915.

Total kilowatts increased from 219,440 on June 30, 1915, to 243,337 a year later.

Public Relations Outlined by Committee of New England Section.

Three measures have recently been adopted in New England which appear to be inimical to central-station interests, says a report of the Public Relations Committee of the New England Section, N. E. L. A. The 1915 legislature of Connecticut passed an act which taxes electric light and power companies, among other utilities, 1.5 per cent on gross earnings, which has been interpreted by the Supreme Court of Errors to mean gross receipts. The same legislature also passed an act which allows corporations doing a wholesale business in the manufacture, transmission and sale of electricity also to retail their product. The law apparently allows anyone to make and sell electrical energy, so that any private plant may extend its lines across the street and some neighboring plants with little restriction, giving little or no protection to present companies and placing great power in the hands of the regulating commission.

The Vermont Public Service Commission recently issued an order which forbids a light and power company to occupy a public way with its lines carrying electricity "of high voltage," without written authority of the Commission, the object being to limit the placing of poles on the wayside to absolute necessity, and to bring about the use of private rights of way as far as possible. If by high voltage is meant energy of 2,200 volts, and over, the committee believes the order imposes hardship on the companies and should be modified, since it is likely to impose unreasonable delay on ordinary extensions.

Standing Committees Appointed by Lighting Fixture Manufacturers.

The Lighting Fixture Section of the Associated Manufacturers of Electrical Supplies held a special meeting October 25 at the Hotel Biltmore, New York City, at which W. D. Steele, of the Benjamin Electrical Manufacturing Company, Chicago, Ill., the new chairman of the section, presided. The following standing committees, covering the various lines of the fixture industry, were appointed:

Committee on Interior Lighting Fixtures: L. Livingston, Edward F. Caldwell & Comapny, New York City; W. H. Spencer, with I. P. Frink, New York City; A. F. B. Harraden, Shapiro & Aronson, New York City; F. W. Wakefield, Wakefield Brass Company, Vermilion, O., and Albert Ullman, Scott-Ullman Company, Cleveland, O.

Committee on Industrial Lighting Fixtures: C. O. Baker, Wheeler Reflector Company, Boston, Mass.; H. W. Bliven, Harvey Hubbell, Incorporated, Bridgeport, Conn., and D. K. Chadbourne, George Cutter Company, South Bend, Ind.

Committee on Street Lighting Fixtures: A. D. Fishel, Adams-Bagnall Electric Company, Cleveland, O.; W. H. Jones, General Electric Company, Schenectady, N. Y., and C. E. Stephens, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Utility Commission May Order Reasonable Improvements.

The Public Service Commission for the First District, New York, has recently been upheld by unanimous decision of the Court of Appeals as to its powers to direct public-service corporations to undertake "reasonable improvements." This decision, described by lawyers familiar with the public-service statutes as far reaching in its effect, reverses a unanimous decision of the Appellate Division, First Department, which annulled an order of the Commission made March 19, 1915, directing the New York and Queens Gas Company to extend its mains and supply service from Bayside, Queens, to Douglaston and Douglaston Manor, sections without illuminating gas. Judge Cuddeback, writing the opinion of the Court of Appeals, holds that the courts have no right to exercise administrative powers such as those possessed by the Public Service Commission. The Commission directed the extension of the gas mains after several hearings. The gas company appealed, contending that the cost would be greater than any financial return possible in the succeeding few years warranted. The Appellate Division upheld this view and describing the order of the Commission as unreasonable, annulled it. The Court of Appeals, however, has decided that the order of the Commission was reasonable and should stand. Counsel for the Commission contended in the latter tribunal that the lower court has assumed to itself powers and duties belonging to the Commission. This view the court took, Judge Cuddeback holding that the Appellate Division had the power only to determine that the Commis-

sion's order was unreasonable in that it was "an unlawful, arbitrary, or capricious exercise of power." He held further that if the decision of the Appellate Division was allowed to stand it would "go far towad defeating the efforts of the legislature to establish agencies to regulate the great public-service corporations."

The Public Service Commission for the First District has directed a reopening of the hearings into the rate for electric current charged by the Flatbush Gas Company, which serves the residents of the Twenty-ninth Ward of Brooklyn. The rate charged by the company is now 12 cents per kilowatt-hour. Hearings in the Flatbush Gas Company case were closed on October 15, 1913, and a decision in the case has been withheld pending a decision in the Brooklyn Edison case. A decision is expected shortly in the latter case and the Public Service Commission has decided to reopen the Flatbush proceeding for the purpose of bringing all statistics and data concerning the operation of the company down to date, so that any rate decision made may be entirely in keeping with facts as they now exist.

Los Angeles Contractors Protest Against "Unfair" Competition.

Many of the electrical contractors and dealers of Los Angeles, Cal., have signed a communication sent to the City Council protesting against what they call the "unfair" competition of certain "unresponsible persons." They suggest that all persons wishing to do electrical construction should register names, business addresses and telephone numbers with the city electrical department, and that a deposit of $50 be made to insure their good faith.

Utility Ordered to Serve Customers Not On Lines.

The Maine Public Utilities Commission has issued an order which is very important from its precedent-making standpoints, in which the Winthrop & Wayne Light & Power Company, a company purchasing its energy supply from the Central Maine Power Company and distributing and selling the energy in Winthrop, Me., and surrounding towns, is required to furnish service to a number of customers off its power lines. Furthermore, the parties are required to present to the Commission written contracts, and to execute such contracts with the lighting company, providing for payment of certain fixed sums yearly, for 10 years, by the eight petitioners two customers to pay $43.80 per year each, and the other six customers $12 per year each, with current in excess of these amounts at the same kilowatt-hour rate of 10 cents.

The company pays the Central Maine Power Company 5 cents per kilowatt-hour for its bulk supply, reselling lighting at 10 and power at 8 to 2 cents.

The cost of the desired extension is about $1,184. The Commission says 6 per cent should be allowed the company for interest and 2 per cent for depreciation reserve. This amounts to $94.72. Assuming a $12 minimum use of current by the eight customers and $27 received for power, the cost to the company would be as follows:

Interest and depreciation	$ 94.72
Cost of the $96 worth of lighting	48.00
Cost of the $27 of power	16.88
	$159.60

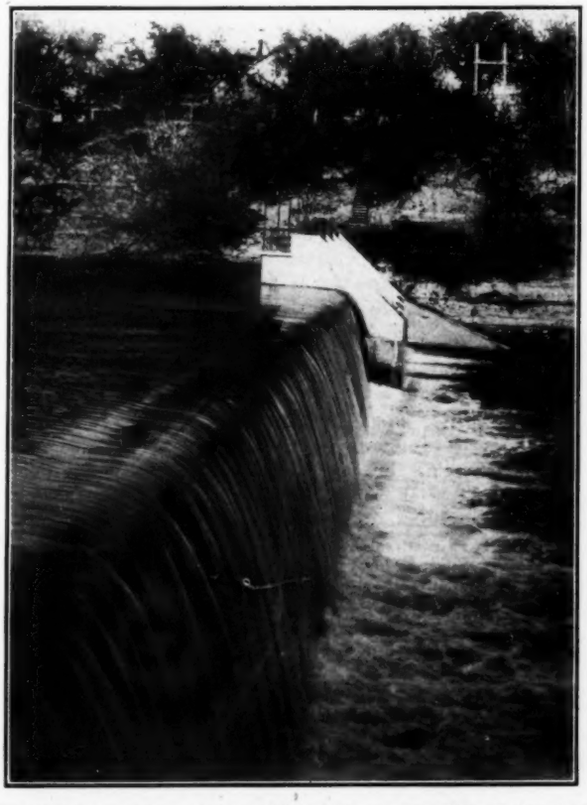
It would thus be necessary for the company to receive an average of $16.58 per customer, together with the $27 for power, to equal this expense. The Commission says that it is not practicable to prescribe a minimum yearly charge of the $16.58 per customer, since their requirements vary widely, but that the contract first referred to should be made, and the total apportioned as nearly as possible among the users. The matter should be left so that if fire should remove one or more customers, the company may come to the Commission for necessary relief.

Depreciation referred to is "future depreciation," the Commission points out. In considering the future the Commission concludes that maintenance and operating expenses, for a few years, will be almost nil, and that when it becomes necessary to provide for maintenance the company will have the profit on all excess current over 80 kilowatt-hours a month, and on power over the estimate.

Line Extensions in Iowa to Serve Farm Communities.

By January 1, 55 additional miles of hydroelectric transmission line will follow the rural highways of the Mississippi River section of northeastern Iowa supplying a dozen new towns and villages and bringing electricity to the front gates of hundreds of farms. The big dam in the Turkey River at Elkader, the county seat of Clayton county, Iowa, and the power plant of Schmidt Brothers & Company beside the dam will furnish the power.

Schmidt Brothers & Company has been supplying Elkader, a town of approximately 2,000 inhabitants, with electricity for a good many years. Some time ago with the dam capable of generating several hundred more horsepower than was being used, the company determined to branch out and was successful in obtaining franchises in Garnavillo and Guttenberg 22 miles away. Work on the line to the two towns was begun several months ago. Garnavillo is already being supplied with current and Guttenberg very soon will be. More recently the company has



Dam on Turkey River in Iowa Where Power For Farm Extensions Is Being Derived.

secured franchises in Littleport, Garber and Colesburg and has bought out the plant at Elkport. Work is now under way on the line which will connect these towns terminating at Colesburg 25 miles distant. A third line radiates out from Elkader to Farmersburg and St. Olaf.

BRITISH GOVERNMENT URGED TO ADMIT AMERICAN VEHICLES.

Report Shows Economy of Electric Vehicles Is Recognized and American Vehicles Are Needed to Supply Demand.

The English Electric Vehicle Committee to whose enterprising efforts in the interests of the electric vehicle reference has been made on many occasions, has once again amply justified its existence. In connection with the British Government's proclamation including restriction of the importation into the United Kingdom of American electric vehicles as part of the measures for easing shipping, Frank Ayton, the secretary of the committee, sent to the Board of Trade, which is the department concerned with the matter, an excellent statement of the case for the electric and reasons against restriction. It is understood that as a result, electrics for commercial use will not now be subject to the embargo. An abstract of Mr. Ayton's clear and effective statement is appended herewith:

My committee asks that electric-battery vehicle chassis intended for commercial uses shall be most favorably treated under the licensing arrangements which have come into force, following the proclamation of June 27. The grounds upon which we make this application are as follows:

1. Before the war the adoption of the electric-battery vehicle for commercial purposes was beginning to make good headway by reason of the economy, reliability and simplicity of this system of motor transport. Since the war, however, the scarcity of horses, the high price of fodder, the continuously increasing cost of gasoline and the dearth of supplies of the latter have all tended greatly to enhance the advantages of the electric vehicle, and have led to its increased use. Thus it is that at the present time some of the leading business houses in this country are adopting, or have already adopted, the electric van for town and suburban delivery work in preference to other types of motor vehicles, and the supply of electric vehicles is not equal to the demand. The reason for this is the more readily appreciated when it is stated that the usual cost of power for operating such vehicles compares with the cost of gasoline for a gasoline-driven vehicle only when that commodity is priced at, approximately, 12 cents per gallon.

2. Since the electric vehicle depends for its power upon electricity supplied (in almost every instance) from the public electric supply undertakings of the country, and, therefore, is produced from coal, its extended use is distinctly assisting in resolving one of the difficulties the government is at present having to contend with, that is, the conservation of gasoline supplies in order to provide adequately for the requirements in this particular direction of the transport services for the forces.

3. As the electric energy required for replenishing the batteries of electric vehicles is in practically every instance taken during night hours, when the demands of other electrical consumers are either very small or nonexistent, the production of such electric energy employs plant that would otherwise be idle, and takes steam from boilers that, in the absence of such demand, would be standing with banked fires, radiation losses continuing the while. Thus it is that the production of such supply needs but a comparatively infinitesimal quantity of coal for its generation, and necessitates no additional capital outlay in extending the plant.

4. Another feature connected with the use of the electric vehicle, which comes distinctly into line with the aim of the government in the matter of freeing men of military age for service in the forces, is the ease and simplicity of operation, making it possible for a woman or an elderly man, possessing no previous experience, to become proficient in driving after but a few hours' tuition.

5. One of the items in regard to which the electric vehicle shows a marked reduction in operating cost is that which is connected with repairs. Its simplicity and sturdy construction makes repairs but a small item in the whole expense of running. At the present time, when every mechanic is urgently required for munitions work, distinct encouragement should be given to the use of a vehicle that by comparison so seldom needs his services for repairs.

6. Were it possible to obtain electric vehicles of British manufacture at the present time, there would be, of course, no justification in putting forward this application. In point of fact, however, the majority of the vehicles now in use, or on order, are of American manufacture. There is at the present time but one British firm making the heavy type of commercial electric vehicle in this country, and it is understood that they are quite unable to cope with all the orders that flow to them, as they have but recently taken up this line of manufacture, and are heavily involved in the production of munitions of war.

7. In the opinion of my committee, the indirect effect in the all-round cheapening of electric supply for power purposes that will result from the general use of electric vehicles should not be lost sight of. The employment of plant in our power stations for the production of electricity in charging such vehicles, at times when otherwise it would be idle, is bound very appreciably to improve the load-factor of the plant, as it has already done in the great power stations of Chicago and New York.

8. The free importation at the present time of American-built commercial electric vehicle chassis will assist in the direction named, and will create such an increased demand for this type that there will be some incentive and a great opportunity, after the war, for British manufacturers to establish the building of such vehicles as one of the staple industries of the country.

New York Companies' Section Seeks New Name for Its Bulletin.

Chairman Walter Neumuller, of the New York Companies' Section, National Electric Light Association, has announced a prize competition, open to members of the Section, the purpose being to obtain a new name for the official organ of the Section, now known as the *Bulletin*. It is felt that the magazine possesses but slight individuality under its present name, which does not raise it above the class of a thousand other magazines in every line of business and industry, bearing the same name. The prize offered for the new name is $10, the contest to close December 4.

Preparations are being made for the meeting of the Section on November 14, at the Auditorium, Irving Place and Fifteenth Street. Sheriff Alfred E. Smith, of New York County, will make the principal address.

Memphis to Have Electrical Fountain.

The electrical interests of Memphis, Tenn., are planning a rather ambitious program for America's Electrical Week. There is a public park in the center of the city, known as Court Square, which contains a very elaborate fountain, and it is planned, with the co-operation of city officials, to convert this into a permanent electrical fountain. If plans materialize, the inauguration of the electrical fountain will be celebrated with an electric night-time parade, in which the merchants and different organized bodies of Memphis will participate. The two successful electrical shows held in that city during recent years indicate that the event will be carried out in a very auspicious manner.

Miscellaneous NEWS NOTES

New Street-Lighting System for Jersey City.—A new incandescent street-lighting system along Monticello Avenue, Jersey City, N. J., comprising an installation of about 5,000 lamps, was opened officially for operation on October 21. The system embraces the entire length of the street.

Lighting Company Restrained from Crossing Lines.—The Public Service Commission of Pennsylvania has handed down an order restraining the Lehigh Navigation Electric Company from furnishing power service at Nazareth, in competition with the Pennsylvania Power Company, holding that the Lehigh company crossed the transmission lines of the latter company to make connection without permission.

Railroad Electrification Discussed at Denver Joint Meeting.—The seventy-ninth regular joint meeting of the Denver (Colo.) Section of the American Institute of Electrical Engineers and the local members of the American Society of Mechanical Engineers was held recently. An informal dinner was served, after which a discussion was held on "Westinghouse Steam Railroad Electrifications," motion pictures portraying the installations on many of the largest railroads of the county.

Civil Service Examination for Expert Electrical and Mechanical Aid.—The United States Civil Service Commission announces an examination on November 14 for expert electrical and mechanical aid, at $12.48 per diem, in the Bureau of Yards and Docks, Navy Department, Washington, D. C. The duties of this position cover the expert maintenance and supervision of operations of all navy-yard power plants, embracing the economical production, distribution, and utilization of electric power for manufacturing, pumping dry docks, charging submarines, and for ships undergoing repairs; compressed air for manufacturing; steam for power and central heating; production and distribution of hydraulic power; also investigations of power-plant operating conditions, tests of plants and equipment, and efficiency-engineering work in connection with improvement of operating conditions and instruction of plant operatives to obtain economical operating results. The appointee will give expert advice upon, and will be held responsible for, the design of new projects for the economical production of power, in which will be included pumping plants for dry docks, power plants and distribution systems for experimental laboratory, projectile plant, armor plant, equipment for supplying power to radio stations, heating and lighting equipment for various prospective public works, such as hull-construction shops, foundries, machine shops, barracks, storehouses, offices, etc.; also upon the design and layout of extensions to present plants to provide for prospective expansion of yards and stations and the remodeling of lighting systems in existing buildings and shops. Competitors will not be assembled for examination, but will be rated on technical education, experience and fitness. Graduation with a degree of mechanical engineer or electrical engineer from a college or university of recognized standing, and at least ten years' subsequent experience in responsible charge of the design, installation, and operation of central power plants and distribution systems for light, heat, and power, with executive experience in handling successfully large numbers of power-plant employees, are prerequisites for consideration for this position. Additional credit will be given candidates who have had special experience in connection with the power and operating requirements for radio work. Applicants must be citizens of the United States and under 55 years old. They should at once apply for Form 1312, stating the title of the examination desired, to the Civil Service Commission, Washington, D. C.

Electric Sign Ordinance at Pendleton.—The City Council, Pendleton, Ore., has passed an ordinance covering the erection of signs in the municipality. The measure prohibits the installation of any signs which are not electric and particularly specifies that all signs must have electric letters. It also provides for the elimination of all signs now in use which do not conform to the ordinance, including illuminated billboards.

Vaughn and Meyer Consolidate With Charles L. Pillsbury.—Francis A. Vaughn and Hans J. Meyer, of the firm of Vaughn & Meyer, consulting engineers, 1007-9 Majestic Building, Milwaukee, Wis., have joined in partnership with Charles L. Pillsbury, of the consulting engineering firm of Charles L. Pillsbury Company, 805-11 Metropolitan Life Building, Minneapolis, Minn., and 716-20 Capital Bank Building, St. Paul, Minn. Mr. Vaughn and Mr. Meyer will continue to conduct their Milwaukee offices under the firm name of Vaughn & Meyer. The Minneapolis and St. Paul offices will be conducted under the present firm name of Charles L. Pillsbury Company. The headquarters of Mr. Pillsbury and Mr. Meyer will be in the Minneapolis office; those of Mr. Vaughn in Milwaukee. The three offices cover a wide range of engineering activities, and the combination of these old and well-known organizations will be able to cover an extensive field.

New York Commission Makes Changes in Its Engineering Staff.—The Public Service Commission for the First District of New York has made a change in its engineering staff by which Alfred Craven, at present chief engineer, becomes consulting engineer of the Commission, effective November 1. The position was created for the purpose and in recognition of Mr. Craven's valuable services to the city and to the Commission. At the same time, the Commission designated Daniel L. Turner, who is now deputy engineer of subway construction, as acting chief engineer. Mr. Craven was appointed chief engineer of the Public Service Commission on October 1, 1911.

Telephone Dispatching of Tugs.—Tugs engaged in New York harbor service for the Lehigh Valley Railroad will soon be equipped with telephones. When a tug touches at one of the company's piers, without leaving his place in the pilot house the tug captain will be able to call up the tug dispatcher at Jersey City on a private wire leased by the railroad from the New York Telephone Company, report his arrival and learn what he is to do next. To make this possible, cut-in boxes are now being placed on the ends of each of the Lehigh Valley piers in New York, Brooklyn, Jersey City and the Bronx. The tugs also are being equipped with the necessary apparatus.

Public Service Corporation Offers Stock to Employees.—The Public Service Corporation, Newark, N. J., has offered a limited number of shares of stock to employees of its subsidiary companies, including the Public Service Electric Company, Public Service Gas Company and Public Service Railway Company. The issue is to be at $130 a share, about $6 less than the current market quotations, on the easy-payment plan. Subscriptions will be received for not less than one or more than one hundred shares up to November 15, and allotments will be made immediately thereafter. The terms include an initial payment of $5 on each share before January 2, 1917, and $1.50 per month per share until paid for; dividends will date from January 1, on a basis of 8 per cent. The stock offered is not a part of the $5,000,000 issue recently authorized. The plan will be under the jurisdiction of the welfare committee of the corporation, and preference will be given to small subscriptions. A similar offer was made by the corporation in 1913, when nearly 1,000 employees acquired stock to a total of 5,300 shares.

Electricity in a Steel Rolling Mill

Details of the Electrical Equipment in the New Plant of the St. Louis Screw Company Where an Initial Installation of 4,061 Horsepower Has Been Made—All Energy Is Purchased

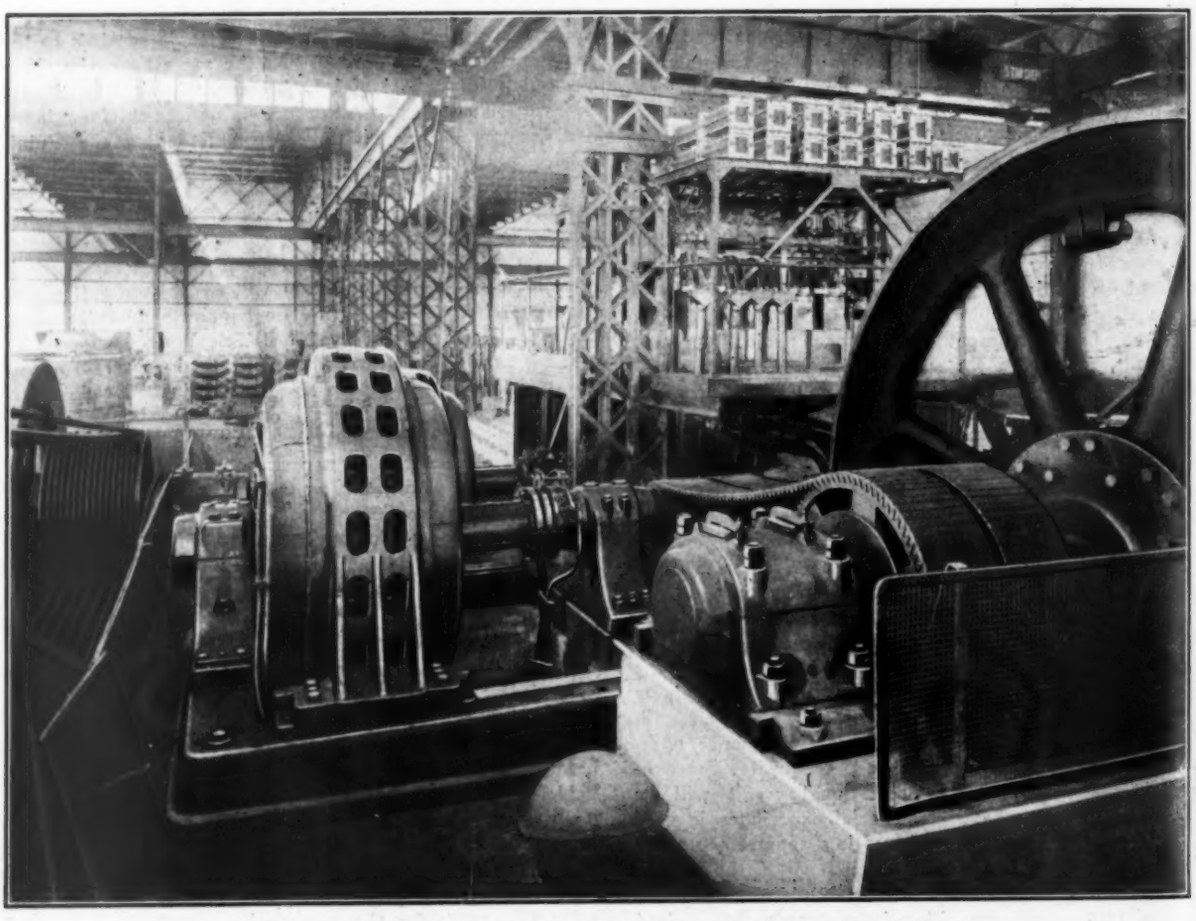
By W. L. BERRY

Industrial Power Series—Article No. 180.

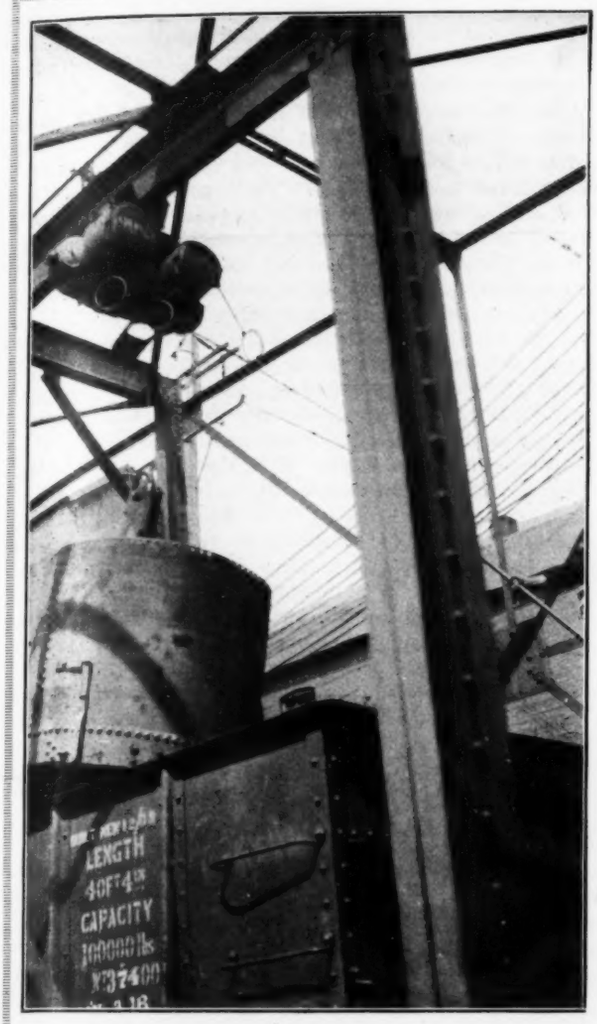
ON ACCOUNT of the availability of waste heat for the generation of steam, iron and steel rolling mills are possibly the class of industry most difficult to convert to central-station service. Of the mills operating today with purchased power, the majority were new installations or plants in which extensive repairs or extensions had become necessary. In the case of the St. Louis Screw Company it was a new installation. This company made a careful investigation of the subject and finally decided to purchase power for all its requirements from the Union Electric Light & Power Company of St. Louis.

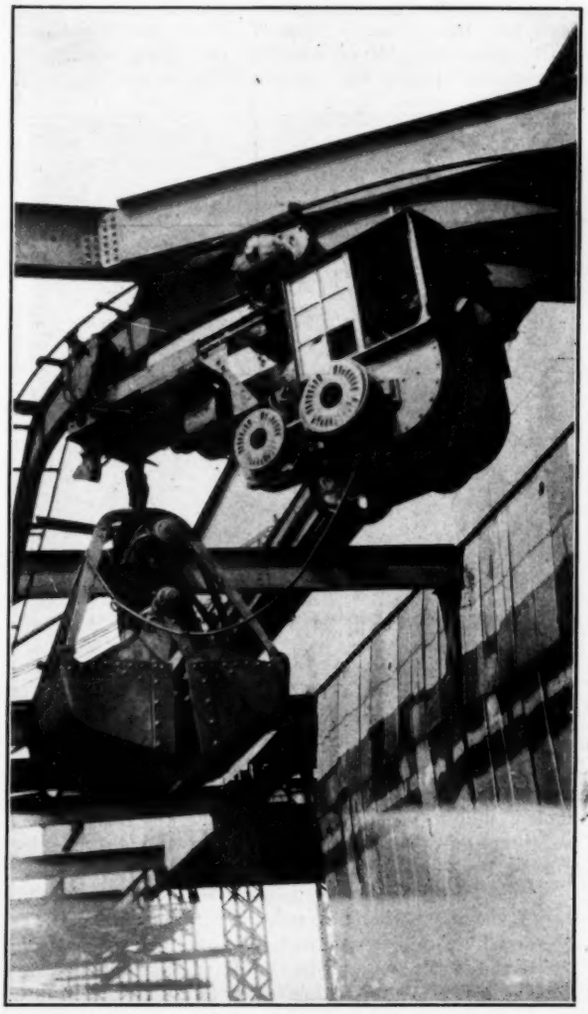
The most important factors given consideration in deciding the matter were the very high installation expense of a waste-heat plant, its rapid depreciation, high upkeep expense, the load-factor obtainable and the many obvious advantages of central-station service. While this article makes no attempt to draw a comparison of the cost of operation under both systems, it can be briefly stated that with the isolated plant the fixed charges are high and the operating expense low as compared to purchased power in which the cost of current, or the operating expense, is relatively high and the fixed charges practically nothing. In cases of this kind the determining consideration is the load-factor. The higher the load-factor the more economical the waste-heat plant becomes because the fixed charges are divided among a larger number of kilowatt-hours. However, it is the writer's opinion that where all expenses are properly taken into account, the difference in favor of the waste-heat plant, if any, will be so slight as to be greatly outweighed by the many advantages of central-station service. This is especially true in the case of a steel rolling mill in which the reliability of power service is of very great importance. Has it ever occurred to you that there is only one argument that can be advanced in favor of any isolated plant? That is a lower cost of operation, whereas the advantages of central-station service are so numerous that they cannot even be touched upon in an article of this kind.

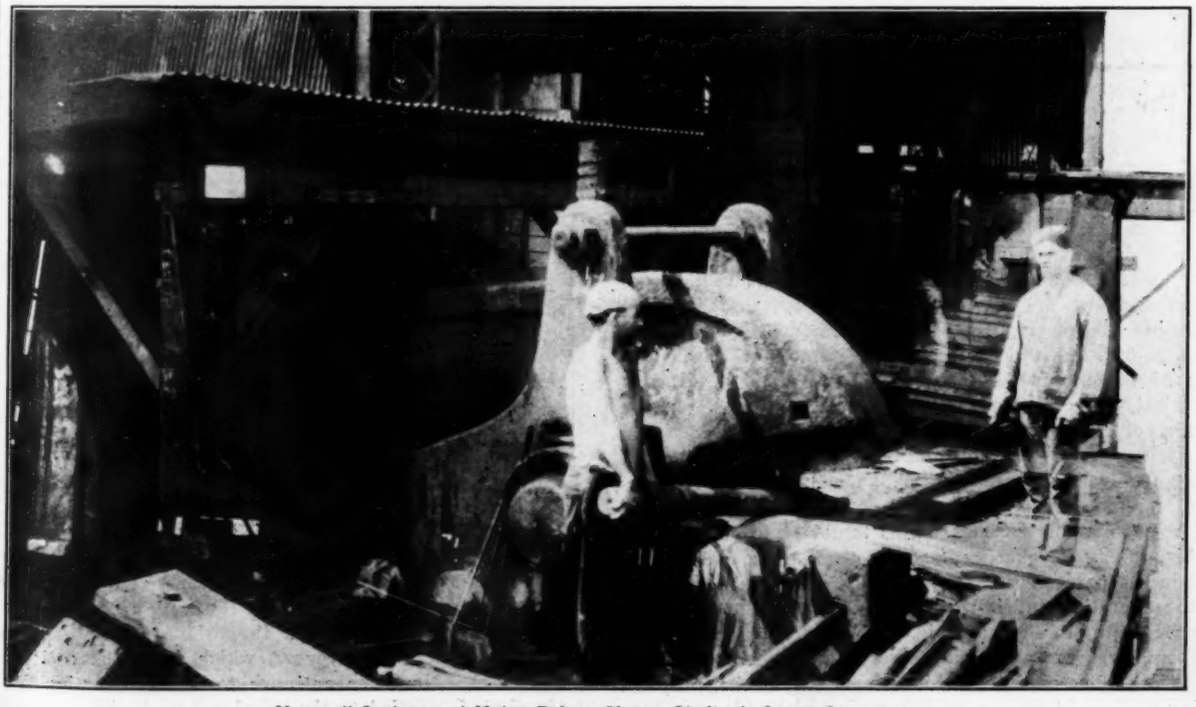
Electric service is supplied to the 4,000 horsepower installed in the rolling mill from the great hydroelectric plant on the Mississippi River at Keokuk, Iowa. It enters the substation of the St. Louis Screw Company in the form of 13,200-volt, three-phase, 25-cycle alternating current. Within the substation are nine transformers together



An 18-Inch Finishing Mill in St. Louis Plant Driven by 600-Horsepower Motor.

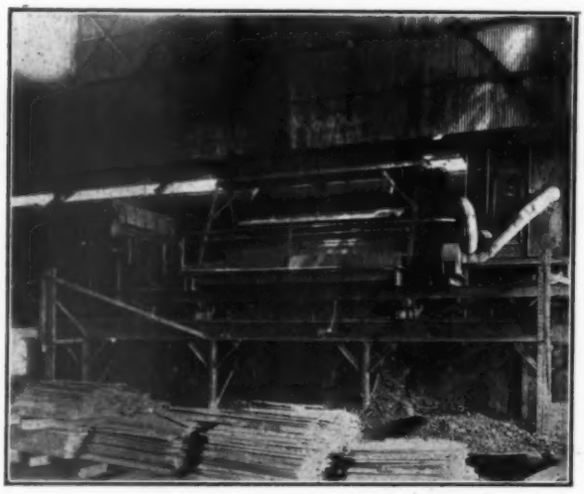






Monorail System and Motor-Driven Shear—St. Louis Screw Company.

with the necessary lightning arresters, oil switches, panelboards and a motor-generator set to supply direct current to the crane and monorail system. There are three 300-kilovolt-ampere transformers with a secondary voltage of 2,200 supplying service for the operation of the steel-mill



Traveling Tumbler—Rust Collector Showing Motor Control on Left.

motors, totaling 2,250 horsepower. Three 150-kolovolt-ampere transformers, secondary voltage 440, supply service to a miscellaneous motor load of about 1,800 horsepower. Three 20-kilovolt-ampere transformers, 230-115 volts secondary, answer the lighting requirements of the plant. All transformers are of the single-phase, oil-insulated, water-cooled, indoor type,

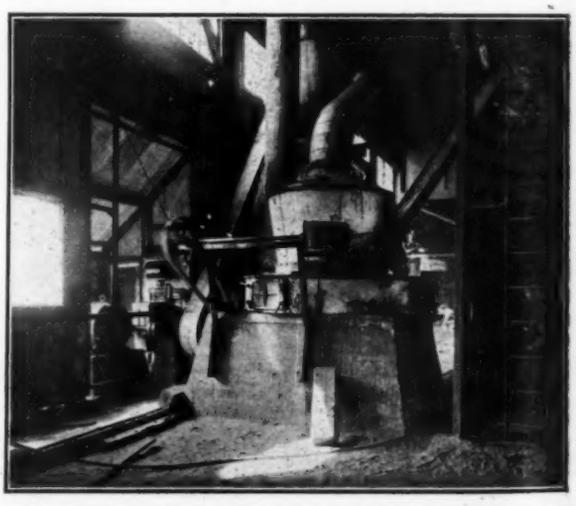
The three mills now installed are an 18-inch finishing mill, a 14 by 9-inch finishing mill and a 20-inch puddle mill. Each of these is driven by a 600-horsepower slip-ring motor with variable speed, reversing control. The 14 by 9 finishing mill is operated by a 15-strand rope drive, but with the other two mills Morse silent-chain drive is used. The writer believes this latter to be a departure in standard steel-mill practice. The drive consists of two sparate chains each 17 inches wide. There is a distance of about eight feet between pulley centers. These chains have been operating for about two years and have given perfect service, no trouble of any kind having been experienced with them. A fourth mill, 10 by 8-inch finishing, has not yet been installed but will be within the next year.

Operating Processes.

A brief description of the operation of the plant might be of interest. Two kinds of scrap iron are brought into the mill on railroad cars, puddle scrap and bushling scrap. The puddle scrap is transferred to the puddle mill where it is rolled into flat bars, cut into short lengths by shears and moved to the fagot-making department. The bushling scrap is dumped into the scrap yard where there is a battery of ten motor-driven shears of all sizes, ranging in electrical capacity from 10 to 100 horsepower. These shears cut the scrap into small lengths and it is then raised by means of an electromagnet into raised bins located along the end wall of the plant. Under these bins is located a track along which an electrically driven tumbler and rust collector operates. This tumbler moves from bin to bin, taking its charge of scrap, cleaning it, collects the rust in a separate receptacle, discharges its load at the end of the operation and is then moved along the track by an electric motor to the next bin. The rust is removed from the tumbler by means of a blower and is discharged from the rust collector into a bin provided for the purpose. This rust is sold to gas manufacturing plants for purification purposes. One of the accompanying illustrations shows this traveling tumbler rust collector with its motor control devices. There are three motors on it, a 3-horsepower motor for raising and lowering the door, a 30-horsepower motor to operate the tumbler proper and a 15-horsepower motor to propel it along the track.

After the scrap is cleaned it is made up into fagots. These are made by tieing four flat bars from the puddle mill together with iron wire and filling the inside with cleaned bushling scrap. The fagots are wheeled on hand cars to the furnaces where they are brought up to a welding heat. They are then removed from the furnace with the aid of a pull-out machine which is direct connected to a 5-horsepower motor by means of a worm gear, and are passed to the rolling mills. After passing through the mill, the rolled steel is dragged into position opposite the cooling bed by a motor-driven pull-over machine. Motor-driven conveyors with raised fingers then drag the material into place on the cooling bed. These conveyors alse force the cooled material into a runway where motor-driven rolls propel it to the shears. Here the material is cut into proper lengths and is taken to the warehouse by means of a five-ton crane. From the warehouse the material is either shipped out for the trade or is transferred by the crane to other departments for the manufacture of the company's product of nuts, bolts and screws.

A complete coal pulverizing plant is installed. This consists of a Raymond pulverizing mill direct-connected to a 100-horsepower motor, a tube mill geared to a 200-horsepower motor and two heating furnaces belt driven by two 20-horsepower motors. The tube mill will eventually be replaced by a second Raymond mill. The coal-handling system might be also of some interest. Slack coal is brought into the plant on a railroad switch over which the monorail system extends. It is transferred from the cars to the coal hoppers by means of the clam-shell bucket of the monorail system shown in one of the illustrations. From the hopper the coal drops into the Raymond mill. Here it is pulverized and agitated. A forced draft of air from a blower carries the finer particles through a screen into the dryer. By means of the coal-



100-Horsepower Motor Direct-Connected to Coal Pulverizer.

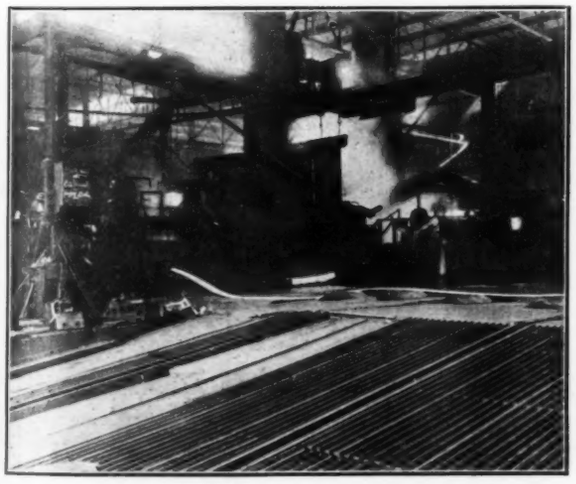
fired furnace of the drying machine all the moisture is removed from the powdered coal which is discharged into a bucket conveyor. This elevates it and dumps it into a screw conveyor, which deposits the coal into bins near each furnace. Leading from these bins are spouts connecting with screw conveyors, which force the coal into the furnace. Near the entrance to the furnace a forced draft of air is applied to the powdered coal with the result that it is sprayed into the combustion chamber in a man-

ner very similar to an oil-fired furnace. This method of firing insures almost perfect combustion and practically no smoke is emitted from the stacks at any time. Such ashes and scale that gather are picked up by another section of the monorail system and conveyed in a hinged-bottom bucket to a railroad switch where they are dumped. It will be seen that this system is a very efficient one. The coal constantly moves in one direction from the time it enters the plant as slack until the ashes are removed to the freight cars. The labor utilized in this part of the plant has been reduced to a minimum and consists of only one man who is stationed in the pulverizing plant.

In the handling of working material, efficient routing has also been carried out. Rusty scrap is dumped into bins at one end of the mill and is constantly moved in one direction until it reaches the warehouse in the form of finished bars. There is no doubling back and forward of working material. There is also a very noticeable absence of manual handling of material. With the exception of wheeling fagots on hand cars from the make-up bench to the furnace, a very short distance, all material is moved by mechanical machines, assisted by four five-ton cranes and the monorail system. Forced draft is supplied to the eight heating furnaces from a direct-connected 50-horsepower blower system. This can be seen in the view showing the 18-inch mill in operation.

Motor Drive in Screw Department.

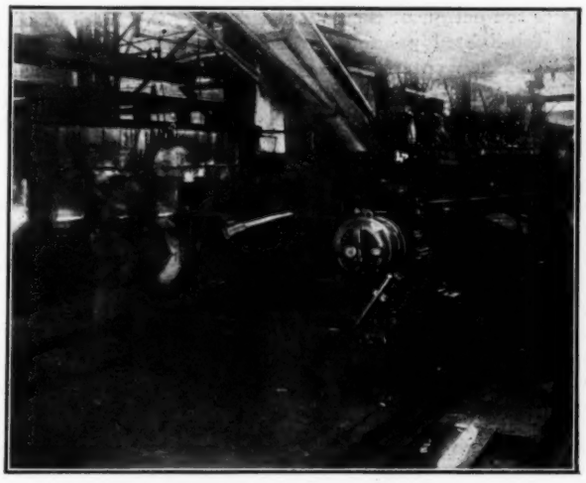
The screw department is now located several city blocks from the rolling mill, and is operated by an isolated direct-current plant. This department will be moved within the next year to the rolling mill and will employ about 450 horsepower in alternating-current motors. The nut department with a connected load of 169 horsepower is now being erected. The 10 by 8-inch finishing mill is not yet installed but will probably go in within the next year. It will employ a 350-horsepower motor on the roughing rolls and a 100-horsepower motor on the finishing rolls. The crane and monorail system, for which power is supplied by the 50-kilowatt motor-generator set in the transformer sub-



View of 18-Inch Mill in Operation—Driven by 600-Horsepower Motor.

station, is very complete and connects all parts of plant together. The arrangement is such that the I-beam of the crane forms part of the monorail system. Cooling water is supplied to the rolls by a deep-well pump. The water then runs into a hot well where it is cooled and then used over again.

An engineer entering the plant of the St. Louis Screw Company must be favorably impressed by its general efficiency, which in large measure is due to the arrangement made possible by the use of electric motors and central-station service. Space has been economized by the use of motors for driving the mills. There are two 600-horsepower motors in a space about 25 feet square. If steam units were used, much more space would become necessary, the present arrangement of machinery could not be



Fagot Pull-Out Machine With Worm-Gear Driven Motor.

used and it is possible that the handling of material could not be so efficiently carried out. The mill is exceptionally clean and cool and due to the evenness of speed of electric motors not only can more iron and steel be rolled but a better product is obtained.

Motor Data.

Below is a list of the motors installed in the plant:

No.	Horsepower.	Application.
1	600	18-inch finishing mill.
1	600	14x9-inch finishing mill.
1	600	20-inch puddle mill.
1	350	10x8-inch finishing mill.
1	100	
1	200	Tube mill for coal crushing.
1	100	Raymond mill for coal crushing.
2	20	Coal dryers.
1	75	Motor-generator set.
1	100	Scrap shear.
1	25	Scrap shear.
5	15	Scrap shears.
3	10	Scrap shears.
1	50	Furnace blower.
1	7.5	Blower for coal spray.
1	50	
1	15	Traveling tumbler and rust collector.
1	3	
1	15	Coal conveyor.
1	30	Hot saw.
1	30	Machine shop.
1	2	Hack saw.
1	5	Pull-out machine.
1	15	Finish shears.
1	25	Hot well pump.
1	30	Finish shears.
1	5	Pull-over machine.
1	5	Runway rolls.
1	10	Pulling-up machine.
1	15	Deep well pump.
1	30	Air hammer.
1	5	Blacksmith shop blower.
1	200	Crane motors.
1	169	Miscellaneous motors in nut dept.
1	450	Miscellaneous motors in screw dept.

Lighting the Cleveland Museum of Art

A Notable Example of the Application of the Principles of Illuminating Engineering to Secure Effective Illumination of Works of Art

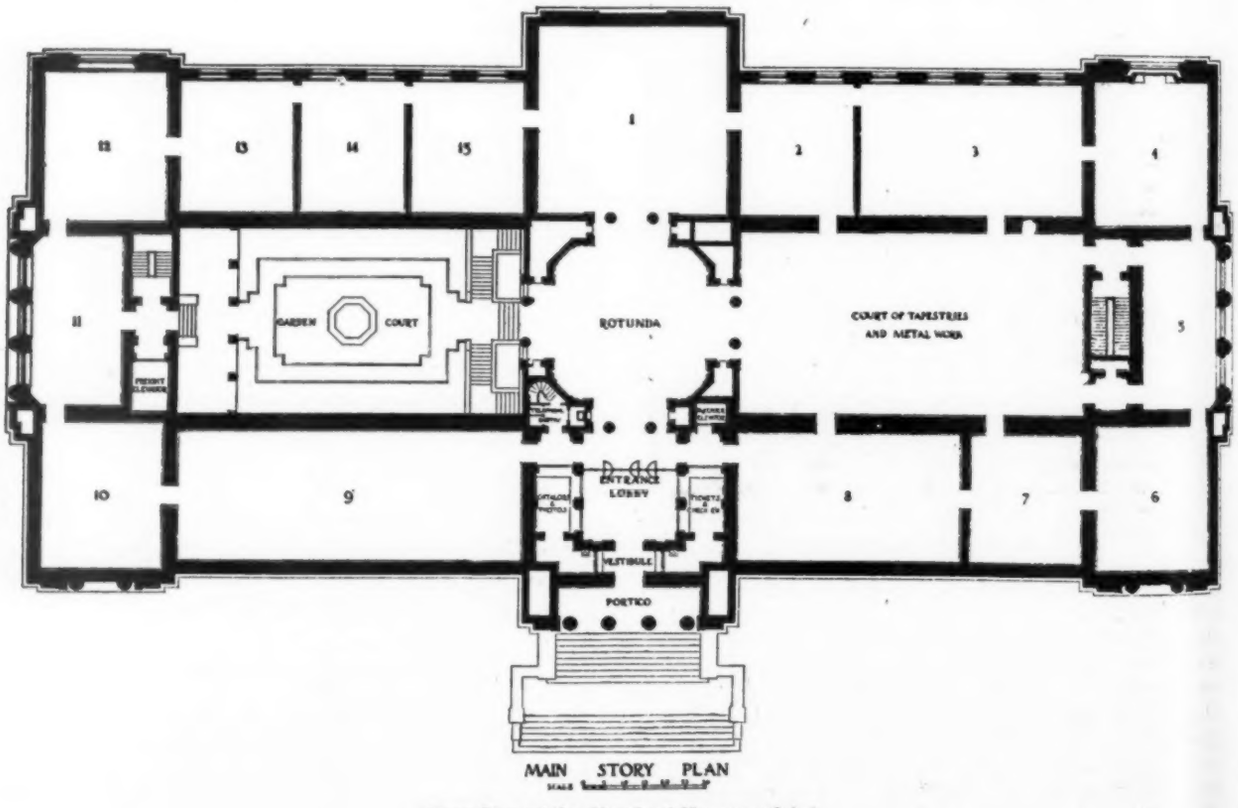
IN the design of the artificial lighting installations of the top-lighted painting galleries two somewhat opposing elements enter. It was not found feasible to produce the most desirable illumination of the hanging walls and at the same time secure the most pleasing effect on the ceilings from the standpoint of the uniform brightness of the sub-skylight. It was the judgment of the committee that any necessary sacrifice in the latter should be made in order to accomplish the best possible lighting of the hanging walls of the galleries. After this had been done every effort was made to render the sub-skylights as uniform in brightness and otherwise as pleasing as it was possible to do.

This article is taken from the report of the Committee on Lighting of the Cleveland Museum of Art, of which Edward P. Hyde was chairman. The work was largely due to a sub-committee consisting of E. J. Edwards, Ward Harrison, and M. Luckiesh. The report was presented as a paper at the tenth annual convention of the Illuminating Engineering Society, held at Philadelphia in September. It describes the means applied to obtain effective daylight and artificial lighting in rooms utilized for different purposes, and sets a new standard in the lighting of museums and picture galleries by the application of light of proper color, proper diffusion and proper intensity, and the avoidance of glare and annoying reflections. Details of the installation and the resulting illumination are given.

The control of daylight in the top-lighted painting galleries has been accomplished by the design of controlled, adjustable louvers. This system was the ultimate development of efforts to accomplish, without the use of random perishable cloth screens, the first three of the following four desiderata, which the committee formulated as criteria to be met by both the daylight and artificial light installations: (1) That the brightness of the floor and ceiling should not be disproportionately large in comparison with the brightness of the walls; (2) that the component of light vertically downward should not be disproportionately large in comparison with that directed toward the important hanging space on the walls; (3) that there should be no opportunity for the reflection of brightly illuminated portions of the skylight, or of any other bright part of the room, from the glazed pictures into the eye of an observer standing at a reasonable distance; (4) that the quality of daylight should be approximated as nearly as possible in the artificial lighting of the museum.

A unique feature of the present installation is the accomplishment of the last of the above four desiderata in the artificial lighting of the museum. Recently the importance of the quality of light in its influence on paintings and other colored objects has become generally appreciated, and the practical availability of "daylight" artificial sources has been rendered possible. The museum has been lighted almost throughout with Mazda C-2 lamps, which produce an illumination similar to that of daylight.

In Fig. 1 is given the general floor plan of the museum as a basis of reference in the following detailed reports of the installations provided for the various rooms.



Floor Plan of the Cleveland Museum of Art.

Rotunda.—The rotunda is located centrally with respect to the exhibition rooms. From the standpoint of artificial illumination, it presents a somewhat difficult problem, since it is open to rooms on four sides, and each of these four adjacent rooms is distinctive in character. The colonial room, on the north, is a square exhibition room, lighted from the top to a relatively high intensity. On the east, the armor court is a much larger room with a considerably larger sub-skylight proportionately, and lighted to a somewhat lower intensity than the colonial room. On the west is the garden court, which is lighted as an outdoor area, and, therefore, to a comparatively low intensity. The south side opens to the main entrance, which is not lighted brightly, and where daylight quality of illumination was not employed.

In order to avoid the effect of wide contrasts of intensity and color, it was thought best to illuminate the rotunda to an average intensity, and to an average color effect with respect to the surrounding rooms. It appeared desirable for this room, in addition to obtaining a fair average intensity and color effect, that the lighting be done without any visible high-brightness sources, and that the dome be lighted to an even and low brightness, taking particular

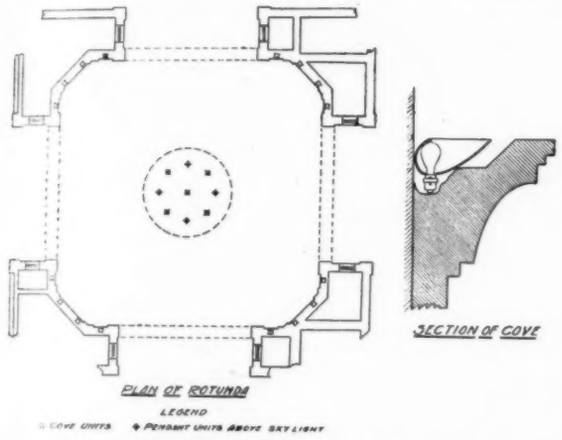


Fig. 2.—Arrangement of Lamps in the Rotunda.

pains to avoid strong patches of light along the cornice, the common fault where cove lighting is used. In the center of the dome is a circular sub-skylight 14 feet in diameter which permits of getting a considerable flux of light into the room with no bright sources visible. The cornice all around the room was constructed in a manner that permitted the placing of lighting units at any desired point along its length about the room. The architect's plan included also eight ornamental bracket units.

The lighting of the rotunda was accomplished by directing the main flux of light through the circular sub-skylight; nine 150-watt Mazda C-2 lamps with X-ray reflectors No. 710 were placed, one in the center and eight on a circle of four feet radius. In addition, 16 small Mazda C-2 lamps were installed in the cove, and spaced as shown in Fig. 2. The X-ray reflector No. E-65 was chosen as being the most suitable for giving the uniform illumination of the dome. The placing of these cove units so that they themselves would be invisible presented a problem, for certain portions of the cornice may be seen from far distant points in surrounding rooms. It was necessary also to use care in locating the cove units in a way to avoid incongruous shadows on the walls and dome.

Regular Mazda lamps of small size furnish the low brightness in the ornamental side brackets. They are not depended upon to furnish any part of the illumination of the room, being primarily a part of the architect's design, but are utilized in the lighting to good advantage in producing a warmer effect than would be obtained without them. Since the rotunda has less skylight than the adjacent galleries, the use of a few visible sources of light seems especially appropriate. The effect in the galleries is that they are brightly lighted from the sky, while in the rotunda there is a feeling that it would be dark without obvious artificial lighting. The dome is finished in a warm color, and contributes toward a warm effect.

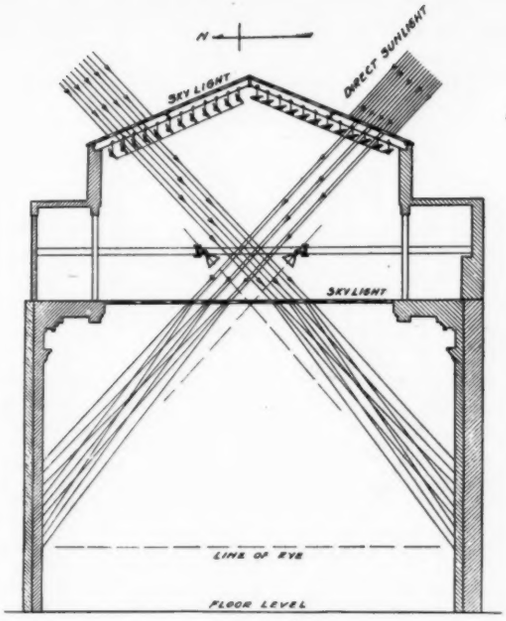


Fig. 3.—Diagram Showing Action of Louvers.

A pleasing effect is obtained in the daytime although no special means is provided for the control of daylight. The circular sub-skylight covers a small proportion of the floor area and does not let in an excessive amount of daylight. The surrounding rooms contribute considerably more than half of the total light received in the rotunda in the daytime.

Measurements under artificial lighting show that the average illumination five feet above floor is 1.5 foot-candles; wall brightness, 0.3 millilambert; floor brightness, 0.7; dome brightness, 0.9 millilambert; reflection coefficient of floor, 41 per cent; wall, 42 per cent.

Top-lighted Painting Galleries. (Fig. 1, Rooms 6, 7, 8, 9, 10).—These galleries are 33 feet in width and of various lengths, aggregating 230 feet. They contain no windows but natural daylight illumination is provided by a sub-skylight 24 feet above the floor. The glass for the roof sky-light had been chosen and already installed before the Lighting Committee was appointed. This is also true of various architectural features, which are directly or indirectly related to the lighting, such as the area of the sub-skylight

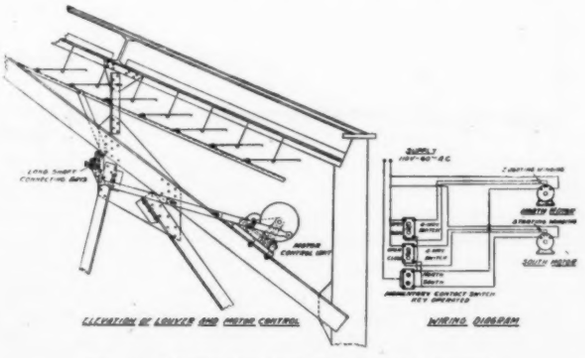


Fig. 4.—Motors for Controlling the Louvers.

opening and the character and position of the structural beams in the attic space.

The committee was concerned with the control of the natural daylight illumination as well as with the design of the artificial lighting system. It was the aim of the committee to accomplish the following desiderata:

(1) That the brightness of the floor and ceiling should not be disproportionately large in comparison with the brightness of the walls.

(2) That the amount of downward light should not be disproportionately large in comparison with that directed toward the important wall space.

(3) That there should be no opportunity for the reflection of bright portions of the skylight from the glazed pictures into the eye of an observer standing at a reasonable distance from the pictures.

(4) That the quality of daylight should be approximated as nearly as possible.

It was necessary to conceal all controlling and lighting apparatus in the attic space in order to preserve the beauty of the rooms as a whole. This requirement eliminated from consideration various schemes that have merit. In order to direct the light from the attic space through the sub-skylight glass, the latter could not be of the so-called diffusing type. On the other hand, it could not be transparent without revealing to the observer the network of structural beams, which were inconveniently close to the sub-skylight, and also the controlling and lighting apparatus. Furthermore, the sub-skylight was so extensive in area that the application of simple optical laws disclosed the fact that if the glass was of the diffusing type, and thus became a bright secondary source when illuminated, there would be great annoyance due to lack of fulfillment of desideratum (3). Thus it became necessary to consider the character of this glass very carefully. It was necessary to use a glass which transmitted no rays of light without changing their direction slightly, although the general direction of the beam must not be altered. An irregular crystal glass was chosen which fulfilled the following requirements: (*a*) it concealed the beams, etc., in the attic space, so that in the daytime the ceiling presented a fairly uniform appearance; (*b*) it eliminated any unavoidable irregularities in the illumination on the walls; (*c*) it minimized the brightness of the sub-skylight by minimizing the amount of light re-emitted by the glass as a secondary source. It is readily seen that requirements (*a*) and (*c*) are such that it was necessary to effect a compromise in selecting the glass. In doing so requirement (*a*) was satisfied first and then (*c*) was considered. It was necessary to use a wired glass but owing to the irregular surface of the glass chosen the wire is not easily distinguished by an observer standing on the museum floor.

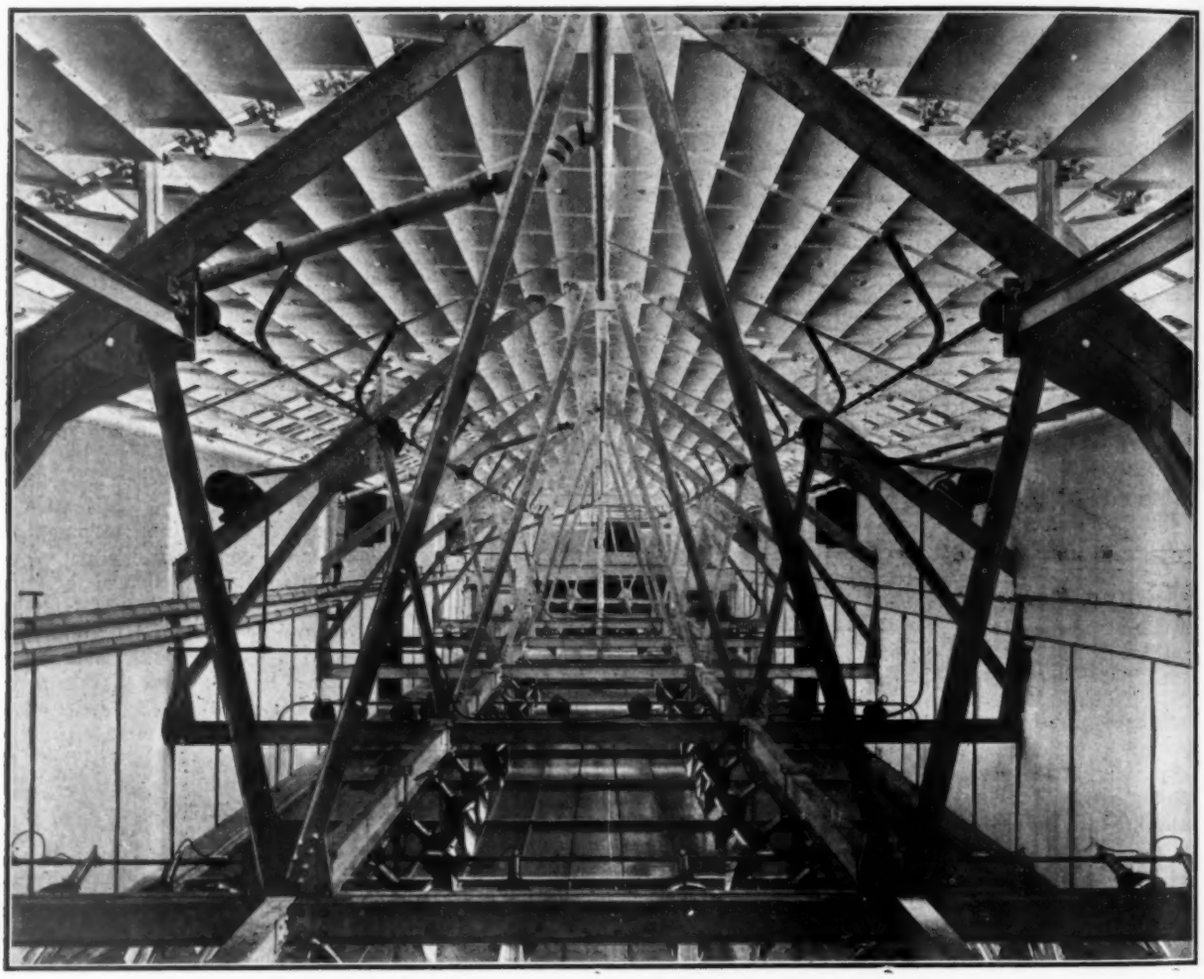


Fig. 5.—Louver System and Arrangement of Electric Lamps and Reflectors.

Regarding natural daylight it was the aim (*d*) to control the intensity, which varies enormously throughout the day and year; (*e*) to preserve a balance of illumination on opposite walls; (*f*) to decrease the excessive downward light; and (*g*) to eliminate the rake of the sun.

For controlling daylight and accomplishing the foregoing desiderata, a system of adjustable metal louvers was designed

and installed close to the roof skylight. These are operated by electric motors remotely controlled by means of switches placed at convenient points in the galleries. The louvers, which are shown diagrammatically in Fig. 3, are divided into two units for each gallery. The unit on the left side of the roof permits light to proceed directly toward the wall on the right side of the gallery and yet does not permit much of the light from the sky or sun to reach the floor of the gallery directly. Each unit is operated by individual electric motor-control, the details of which are shown in Fig. 4. It is possible to operate the louvers either forward or backward in order to obtain the proper position.

The individual louvers are 16 inches wide and are hung 12 inches apart, thus providing overlapping, which makes it possible to obtain a proper intensity of illumination on the pictures without a strong vertically downward component. Obviously the ratio of the width of the individual louvers to their distance apart could have been realized throughout a wide range of dimensions; however, another factor entered the problem, namely, the desirability of being unable to distinguish the louvers and the clear strips of sky between them when the louvers were open. By reducing the width of the louvers and their spacing by the same percentage they would become so small finally that the bright and dark strips would be unresolved when viewed through the sub-skylight glass. For practical reasons the dimensions were made as large as possible without sacrificing this desirable feature. Certain lines in Fig. 3 represent rays of light and by means of this diagram the foregoing points are illustrated. A photograph of the louver system is shown in Fig. 5. In Fig. 6 is shown a daylight view of Gallery 8 with the louvers adjusted to give a proper illumination intensity and uniformity.

In order to approximate natural daylight as closely as is economically possible at the present time Mazda C-2 (daylight) lamps were used, thus accomplishing desideratum (4).

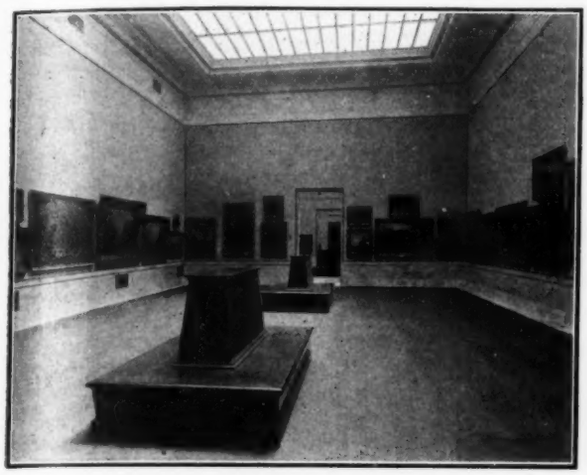


Fig. 6.—Daylight View of Gallery 8.

Fig. 7.—Artificial Illumination of Gallery 8.

It was found most feasible to accomplish desideratum (2) by using projector units (X-ray reflector No. 800) placed above the sub-skylight as shown in Figs. 3 and 5. A special holder was designed by means of which it was possible to adjust each unit to the desired angular and focal positions. One lighting unit was provided for each 3 or 4 feet of wall-length. In order to obtain satisfactory uniformity of illumination on the principal wall area it was necessary to adjust the units very carefully; therefore the lamps, which were 150-watt Mazda C-2, were eventually slightly frosted with an etching solution so that this difficulty would not confront those responsible for the maintenance of the installation. The same result could be obtained by using a sub-skylight glass having a slightly more spread transmission but this would also increase the brightness of the glass, which it was the aim to minimize. Scoops were attached to the reflectors in order to intercept the direct light from the lamp. Many details such as painting the louvers, beams and walls in the attic space were carried out with the object of making the whole as pleasing in appearance as pos-

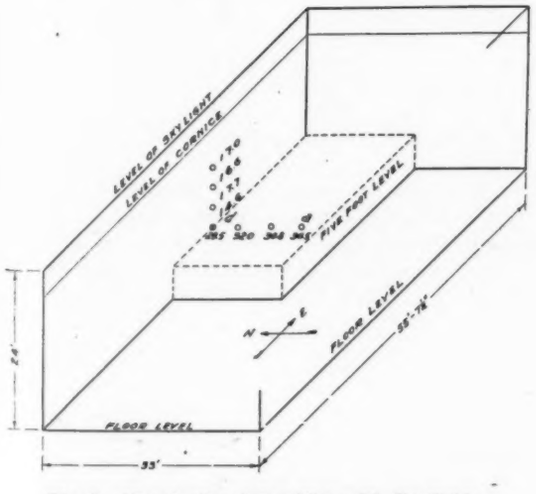


Fig. 8.—Illumination Intensities with Daylight.

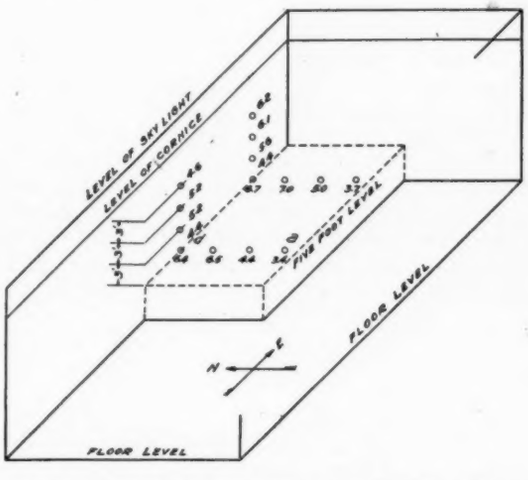


Fig. 9.—Illumination Intensities with Electric Light.

sible. Throughout the work it was necessary to distinguish between illumination and its effect, namely brightness—a distinction too often neglected. A photograph of Gallery 8 under artificial illumination is shown in Fig. 7.

The measurements of daylight illumination were made on a clear day when the intensity and distribution of natural light were fairly constant during the period required for completing the observations in a given room. In the top-lighted painting galleries the distribution of light obviously depends upon the positions of the louvers and for the daylight test these were set by the museum authorities and the resulting lighting conditions appeared sufficiently satisfactory to be considered representative for test purposes. It is of interest to note that in this case the illumination intensities on the opposite walls as adjusted by the louvers were found to be within 10 per cent of each other. Measurements of illumination and brightness were made on the principal wall space and on a horizontal plane five feet from the floor. Average results in foot-candles for natural lighting with the louvers in the position considered satisfactory are shown in Fig. 8. Point *d* was on the north wall (which received direct sunlight unless intercepted by the louvers) and point *d'* was on the south wall, which does not receive direct sunlight under any condition. Obviously on a clear day the south bank of louvers is closed considerably more than the north bank. It should be noted that the south louvers control the illumination on the north wall and the north louvers that on the south wall. Both sets reduce the amount of light reaching the floor. Inasmuch as in such a room in the daytime, relative illumination intensities are of chief interest, it is interesting to note that on a clear day the south wall, which receives no direct sunlight, approximately represents the result that would be obtained on an overcast day on any wall in the room. It is also noteworthy that the brightness of a clear blue sky is less than that of most overcast skies and that it is safe to assume that it is even less bright than an average overcast sky. It is seen that on this day the illumination intensity on a horizontal plane five feet from the floor is less than twice as great as that on the wall space where pictures are normally hung. This is considered as highly commendatory of the louver system because, if an ordinary diffusing sub-skylight had been used, this ratio instead of being two would have been many times greater. Computation shows that this ratio might be easily as high as twenty for an ordinary sand-blasted glass if no louvers or other controlling devices were used, as is the case in many galleries.

In order to show the ability of the louvers to control the ratio of the illumination intensity on the horizontal plane (five feet from the floor) to that on the walls, the louvers were varied in position and at the end of each five seconds, during which the louvers were being electrically operated, illumination measurements were made at *a* (horizontal plane), at *d* and at *d'* (vertical plane). These data are presented in Table I.

TABLE I.—EFFECT OF OPERATING THE LOUVERS.

Time in seconds.	Illumination in foot-candles			Ratios	
	d (north wall)	*a* (5 ft. horizontal plane)	*d'* (south wall)	*a/d*	*a/d'*
0	80	368	25	4.6	14.7
5	72	298	23	4.1	13.0
10	55	196	21	3.6	9.3
15	34	75	19	2.2	3.9
20	17	35	12	2.1	2.9
25	14	26	11	1.9	2.4
30	13	24	9	1.8	2.7

It is seen that the illumination intensity at *d* decreases to about one-sixth of the maximum value, at *a* to about one-fifteenth of the maximum, and at *d'* to about one-third of the maximum. The ratios of the horizontal illumination at *a* to the vertical illumination at *d*, and also to that at *d'*, are shown in the fifth and sixth columns respectively. It is seen that this ratio varies greatly. The smaller values are the more desirable. It will be noted that inasmuch as the ratios *a/d* and *a/d'* are controlled separately and that their values are small and nearly equal at certain positions of the louvers even on a sunny day, the chief aims of the louver system have been realized. In Fig. 9 a brief summary of the measurements of artificial lighting results in Gallery 8 is presented. The numbers on the diagram indicate the intensity of illumination in foot-candles and it is seen from these that certain desired results were obtained.

(To be continued.)

Hydroelectric Operations in Massachusetts.

Sales between electric companies, principally those generating by water power, are reported in the returns filed recently with the Massachusetts Gas and Electric Commissioners. Those of the Turners Falls Power & Electric Company, which during the year put in operation a large generating station at Montague City, Mass., with 21,000 kilowatts of generators installed, were:

SOLD TO OTHER COMPANIES.

	Kilowatt-hours.	
Agawam Electric Company	1,936,919	@$0.0125
Amherst Gas Company	1,307,050	@ 0.01247
New England Power Company	9,195,900	@ 0.00282
Easthampton Gas Company	13,578,800	@ 0.00516
Franklin Electric Light Company	1,104,510	@ 0.01557
Greenfield El. Lt. & Power Company	626,600	@ 0.005
United El. Lt. Co., Springfield	562,800	@ 0.00386
Ludlow Electric Light Company	85,084	@ 0.02
City of Chicopee	1,739,090	@ 0.00728

CURRENT PURCHASED FROM OTHER COMPANIES.

	Kilowatt-hours.	
Greenfield El. Lt. & Power Co.	2,110,800	@$0.003
New England Power Company	6,853,300	@ 0.0099
United El. Lt. Co., Springfield	202,200	@ 0.01

Expenses of production for energy generated by the Turners Falls Power & Electric Company were as follows (kilowatt-hours generated, 45,308,790):

Item.	Amount.	Per kw.-hr.
Oil, waste and packing	$ 3,030.89	0.000067
Water	15.00	.....
Station wages	16,914.51	0.00037
Station expenses and tools	321.72	0.0000074
Station structure repairs	202.97	0.0000046
Hydraulic plant repairs and expense	6,900.79	0.000153
Electric plant repairs	742.20	0.000018
Total	$28,128.08	0.00062

Municipal Electric-Lighting Plant Planned for Memphis.

Having received the rejection of the Merchants' Power Company and the Consolidated Gas & Electric Company of the final proposal of the city in the matter of rates, the City Commission of Memphis, Tenn., is making preparations to go ahead with the construction of the municipal lighting plant, for which a bond issue of $1,500,000 will be sold on November 14. The cost of the plant, according to the estimate of F. W. Ballard, of Cleveland, O., engineer for the Commission, will be $2,980,150, and the Commission will ask the Legislature to authorize the city to vote another $1,500,000 of bonds.

Mr. Ballard's estimates are as follows: Generating station, $292,000; substation, garages, etc., $156,000; underground transmission and distribution, $725,000; overhead transmission and distribution, $120,000; other equipment, $120,000; miscellaneous construction, $277,150; materials and supplies, $100,000; working capital, $40,000, and organization expense, $20,000.

The Merchants' Power and the Consolidated Gas & Electric Companies are conducting an advertising campaign in the newspapers, seeking to influence the voters against the project of the City Commission.

Electric Companies Represented in Denver Home-Products Exposition.—One of the main features of a celebration held in Denver, Colo., recently to advertise Colorado-made products was a parade, in which the electrical industry was represented by the Denver Gas & Electric Light Company and the Albert Sechrist Manufacturing Company. These companies had floats in the parade, the former company having one that explained the value of electricity in the home, and the latter company showing fixtures.

COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

ELECTRIC RANGE TRIUMPHS AT BOSTON.

Boston Edison Company Sells 1,019 Electric Ranges During Year and Anticipates Much Additional Business.

The Edison Electric Illuminating Company of Boston has sold 1,019 electric ranges during the year ended October 31. A combined "experience" and "booster" meeting was held at the Engineers' Club in Boston on the evening of November 1, to celebrate the event. One year ago the company's officials and the appliance and sales departments set themselves the task of selling 1,000 ranges in 12 months. The campaign attracted nation-wide attention, and the beating of "bogie" by 19 brought enthusiastic congratulations from all over the country.

Before the meeting closed the 128 men and 15 women most directly interested in the campaign voted, amid enthusiastic applause and hearty cheering, to sell at least 2,000 ranges in the coming year.

It was estimated at the beginning of last year's campaign that 1,000 ranges would give a total connected load of 4,000,000 watts. Early in the campaign it was seen that the ranges were averaging of larger capacity, and the close of the first year of the campaign showed an estimated connected load of 5,225,850 watts for the 1,019 ranges.

The Wednesday evening jubilation meeting was preceded by dinner, 128 men, including the officials of the company, heads of departments and selling representatives from the appliance and sales departments, and managers and their assistants from the 16 "Edison Light" stores, gathering in the banquet hall of the Engineers' Club.

Features of the Campaign.

The meeting following the dinner was called to order by General Superintendent W. H. Atkins, who reviewed the features of the campaign and gave much interesting information regarding electric-range campaigns in other parts of the country. Letters and telegrams of congratulation from the manufacturers whose ranges have led in the sales during the past year, were read. Their representatives who were present were later given an opportunity to say something in connection with the campaign and the possibilities of electric ranges. All were enthusiastic in their praise of the results secured by the Boston Edison Company, predicted still greater advancement in the improvement of ranges and expressed their belief that the increase in electric cooking bound to come had not yet been even imagined.

Mr. Atkins said:

"On November 16 of last year we met in this room to inaugurate our electric range campaign for 1,000 electric ranges by November 1, 1916, and we have met here again tonight to celebrate the accomplishment of our task and to plan a similar campaign for the coming year.

"I want to congratulate all those who have been instrumental in the success of the campaign on the splendid accomplishment of adding 1,000 ranges to our lines during the year. Success of itself is a suitable reward, and the realization of having reached the goal is indeed an inspiration.

"I should be glad to have the meeting tonight assume the character of an 'experience meeting,' and hear from the men on the firing line incidents and anecdotes associated with the campaign; also problems which had to be solved, troubles encountered, and any experiences which will be of assistance in carrying on the campaign to be started here tonight. I have some figures which are very interesting in this connection.

"In the October 14 issue of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN there appeared a table of central stations offering special rates for cooking. I had a telegram sent to 23 of those having the lowest cooking rate, asking them to wire me the number of electric ranges on their lines and the population of the cities supplied by them. From the replies received I have for comparison chosen those whose rate per kilowatt-hour for 100 kilowatt-hours per month is less than that of our company

One Range for Every 1,000 of Population.

"The Edison Company of Boston, with a population of approximately 1,180,000 in its territory, has sold or already installed on its lines about 1,200 electric ranges, over 1,000 of which have been sold during the last year, the average rate per kilowatt-hour for 100 hours per month (which will be used as a basis) being 2.8 cents. We have one range for every 1,000 of population.

"The time element enters into the figures received, as most of the companies have had their low cooking rate and have been pushing the sale of electric ranges much longer than our own company; consequently the number of ranges per 1,000 of population sold during the last year would probably be larger in Boston than in any of the cities referred to. It is also quite probable that Greater Boston has a larger number of electric ranges installed and sold than any other city of the same population in the country.

"A high class of salesmanship would undoubtedly effect the sale of a certain number of ranges at a comparatively high electricity rate, but the combination of salesmanship and a low rate will produce remarkable results, as has been shown in our own range campaign just finished. These results should furnish inspiration for a still better showing the coming year."

The ranges are distributed in Boston Edison territory as follows: Boston, 300; Brookline, 120; Needham, 80; Newton, 60; Arlington, Canton, Dedham, Lexington, Natick, Walpole, 25 to 50 each. The following towns and cities have from 5 to 25 each: Ashland, Bedford, Dover, Framingham, Holliston, Hopkinton, Lincoln, Medway, Medfield, Milton, Sharon, Somerville, Stoneham, Sudbury, Waltham, Watertown, Wayland, Weston, Westwood, Winchester, Woburn.

It was estimated that the income from each range would be $20.00 per year, but the figures as near as they can be reckoned show that the income will be nearly $25.00, so that the income for the year's work of 1,000 ranges will increase the income of the company about $25,000 annually, and in another year this should grow to $40,000 or $50,000.

It is interesting to note how the bills for cooking have increased during the last few years. In April, 1913, only 16 bills for electric cooking were sent out; in October, 1913, 43 bills were sent; in April, 1914, 62; in October, 1914, 97; in April, 1915, 117; in October, 1915, 155; in April, 1916, 277; in September, 1916, 457; while those sent out last month are about 500.

When all the ranges that have been sold are finally connected, the bills will be something over 1,000, in some cases more than one range being connected on one meter.

In the last 11 months, since the cooking rate was reduced, the company has increased its cooking customers from 155 to 457, or nearly 300 per cent.

"Last year R. S. Hale, head of special research work, estimated that in the next 10 years there would be built 10,000 new apartments in Boston Edison territory, and believed the Boston Edison Company should get at least 5,000 of them, which at $20.00 per year would mean an income of $100,000 per annum. We have in the first year added over 1,000, and the prospects lead one to believe that Mr. Hale's prophecy will be fulfilled.

"In laying out your campaign for the coming year," concluded Mr. Atkins, "I want you to set your own standard, not placing it too high in a moment of enthusiasm, neither aiming too low, but choosing a figure to work for which is reasonable and ambitious and which, with hard work and application, may be realized, so that when we meet again after the year has elapsed, you will be in a position to receive renewed congratulations for another grand success."

Cost of Electric Cooking.

Mr. Atkins then turned the meeting over to C. E. Greenwood, superintendent of the Appliance Department, who congratulated those present upon their results and thanked every one for the hearty co-operation that had made the success of the campaign possible. Referring to the cost of electric cooking in apartment houses, he gave the following information:

	Per Month.
Beacon Apartments, small suites, with ranges of the kitchenette type, average of 50 bills	$1.60
Gilbert Apartments, six and seven-room suites, housekeeping with maids, average of 50 bills	3.12
Colonna Apartments, three and four rooms, kitchenette type of range, average of 50 bills	2.61
The average of 10 private houses with 68 bills	4.67

A. L. Smith, Jr., head of the Range Division of the Appliance Department, expressed his thanks and appreciation of the co-operation that had been given in his division in the strenuous work of the year and then threw on the screen illustrations of the different apartment houses where all-electric cooking has been adopted, and pictures of the types of ranges installed, explaining their different features.

S. W. Wilson, also of the Range Division, spoke of the different questions prospective customers ask. The first usually is, "What does it cost to operate an electric range?" From experience Mr. Wilson estimated the cost from 80 cents to $1.00 per person per month on the Boston Edison cooking rate. Prospective customers also ask: "Isn't it much slower to cook by electricity than by gas?" This, he said, could best be answered by experience and, whatever small "time element" there is, is more than offset by economies and by taking advantage of the stored heat. Some ranges are installed on trial, with the understanding that at the end of 60 or 30 days, if the range does not prove satisfactory, the company will take it back. No range taken on these conditions has been returned.

Prompt Service to Customers.

J. W. Cowles, superintendent of the Installations Department, spoke of the service that department renders customers, and the system of taking care of any troubles. The men in his department who are expected to look after troubles of this kind appreciate the importance of returning a range to service as quickly as possible. Every method available has been adopted to give quick remedial service, a special man being assigned to this work. The Boston Edison Company does not forget, however, that much of the responsibility must rest with the manufacturers, who are held to strict account if any construction difficulties develop.

L. D. Gibbs, superintendent of the Advertising Department, spoke of his department's work in arousing interest among range prospects and giving information in advance of the calls of the Appliance Department's representatives. The aim of his department is always to emphasize, honestly and completely, but without exaggeration, the big selling points in favor of electric cooking, viz.: simplicity, convenience, super-excellence of results and economy. Advertising should be in the nature of an advance agent, making easy the personal approach and carrying the introduction of the salesman. He emphasized the importance of the easy-payment plan, explaining that if the convenience of this plan were properly presented, almost no prospect would refuse the opportunity to buy an electric range.

Miss Mabel Gill, one of the range demonstrators, spoke of the excellence of the cooking, the real economies, and the remarkable convenience as well as simplicity of operation of the electric range.

Some Possibilities of Electric Cooking.

R. S. Hale, superintendent of the Special Research Department, gave his idea of the origin of the word "range" as applied to the cook stove. He thought it came from early days when our ancestors dug pits over which to roast meat. Their idea of convenience when they needed to do a great deal of cooking at one time was to make another pit alongside of the first; perhaps a half dozen were thus placed, and by easy adaptation of terms this range of pits came to be applied to the "range," or row of covers, on the old-time cook stove. Mr. Hale proposed to adopt a similar method in cooking by electricity. "With electricity it is perfectly convenient to divide the power. If with coal or gas one were to put ranges all about the room, the cook would be roasted before the dinner; but with electricity why not divide up the different parts, and go back to the early idea of a range of cooking places, instead of squeezing them close together? The stewpan, frying pan, broiler, oven, do not all have to be in the same place, but with electricity can be placed where most convenient," said Mr. Hale.

"For one thing, consider the flavor. When two foods are cooked side by side, the flavors mix. This is why our home cooking of a few dishes always has a better flavor than hotel cooking where many dishes are cooked in the same kitchen, and why even at home we can get better flavor for a small dinner of one or two courses than for a big dinner of several courses. With electric devices spread around the kitchen, we can get better flavor. When necessary as, for instance, in cooking Brussels sprouts, we can take a long cord and put the electric cooker outside on the balcony or window sill, and avoid all odor in the house.

"To carry out this idea I plan to have no big electric range, but instead a long shelf of convenient width and height. Just above this there would be a line of special receptacles, each of a capacity so that the cord for a single good-sized electric cooker can be plugged in.

"Each of my electric cookers would be separate, with cord and plug, and would ordinarily be kept on a second shelf just out of the way above the working shelf or wherever desired.

"When the mistress of the kitchen wants to prepare a meal, she will take down the appropriate cookers and connect them by means of the plug and cord. For a small meal, she may only use one or two cookers; for a large meal she may use several. When she is through they can all be disconnected and put on the upper shelf.

"I believe the effect is going to be to give distinctly more space in the kitchen to move around in—a kitchen just as cool as one having an electric range, and of course cooler than with gas or coal; and finally, there is going to be less trouble in cooking, and better flavor when the food is done."

Many Instances of Reduction in Rates for Electricity This Fall.

With the approach of the winter months and the lessening of the number of hours of daylight comes an increased demand for lighting and lighting facilities. In the face of this increasing demand it would seem that the producers of electrical energy for lighting purposes would maintain prices, as do most public utilities, and secure greater profits from the greater loads that will result. However, in many cases such is not the fact, for in a large number of municipalities scattered throughout the United States the increasing demand for energy has been met by a reduction in rates. Below are given a few examples of recent revisions of rate schedules made in different cities.

In Waukegan, Ill., the Public Service Company made a reduction, (the fourth in the last two years) effective October 1, the new gross rate being 12 cents per kilowatt-hour for the small consumer and 8 cents for the large consumer, with net for prompt payments of 11 and 7 cents, respectively. For power consumers whose continuous demand is over 50 per cent of connected load, the reduction is about 25 per cent. while for other classes of power users the reduction is from 8 to 10 per cent.

The Scranton Electric Company announced a new rate schedule, effective October 1, reducing the maximum rate for electric lighting from 10 cents to 8 cents a kilowatt-hour, with a minimum charge of 50 cents instead of $1 a month. In all the reduction in rates will average 20 per cent. The company has been making a large gain in business and under the new rates it is expected that a much larger volume will be taken on.

In Moberly, Mo., the Moberly Light & Power Company announced that effective November 1 the rates for lighting service will be reduced from 12 to 11 cents per kilowatt-hour for customers using from 8 to 28 kilowatt-hours per month.

The Hagerstown & Frederick Railway Company, has reduced its maximum rate in Frederick, Md., from 10 to 9 cents per kilowatt-hour with a minimum of 4 cents. In other municipalities the figures are 12 to 11 cents per maximum and 6 cents per minimum. This is the third reduction made by the company within a year. On May 1 the maximum charge was reduced from $1 to 50 cents per month and on August 1 the rates for small power users were decreased from 8 to 5 cents per kilowatt-hour.

At Freeport, Ill., the Illinois Northern Utilities Company has signed a 10-year contract with the city for street lighting and calling for the installation of modern units to be operated at a material reduction in rates.

The Philadelphia Suburban Gas & Electric Company has announced a reduction in the rate for electric energy for light and other house service, effective January 1, 1917, in Roslyn and neighboring sections. The new rate will be 10 cents per kilowatt-hour as against 12 cents, heretofore.

The Milwaukee Electric Railway & Light Company made a reduction in its residence rate schedule, effective October 1, the fourth made in the past three years. As announced in the issue of October 14, the primary step was reduced from 11 cents to 10 cents per kilowatt-hour gross, and the tertiary rate made 2 cents per kilowatt-hour, with a minimum charge of 50 cents instead of $1.

The Union Electric Light & Power Company, of St. Louis, Mo., is planning to reduce its rates for residence lighting about December 1, the company having announced that as soon as its patrons numbered 75,000 a rate of 8 cents per kilowatt-hour would be established in its schedule instead of the rate of 8.5 cents now in effect. The rate for the second step will be 6 cents and for the third step 3 cents. The reduction will be the fifth made in the past few years, during which time the rates have been cut by more than 45 per cent and the number of customers increased by 160 per cent. The policy of this company is evidently an important factor in its success in obtaining customers.

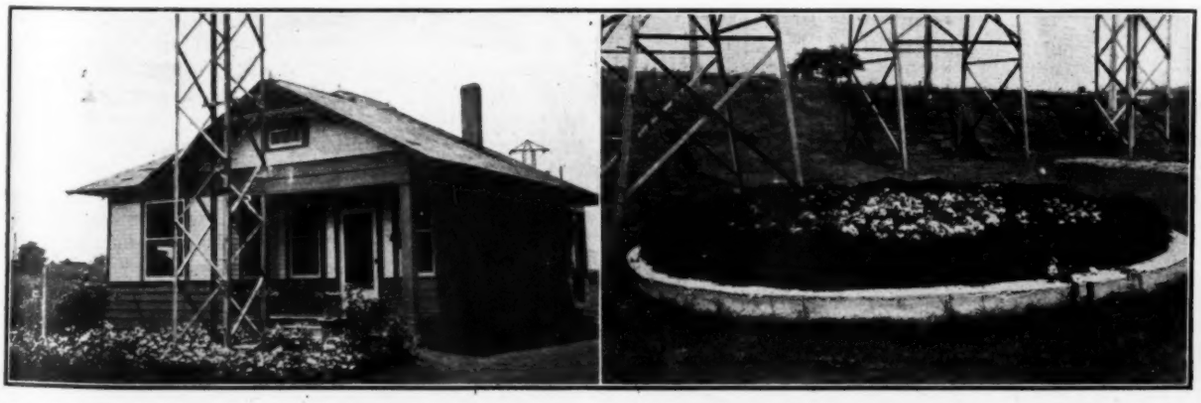
There are numerous other instances of reductions in rates that have been made by central stations this fall, all showing the tendency toward the cheapening of electricity, which fact combined with the many labor and time-saving devices augurs well for the greatly increased use of electrical energy.

Selling a New Product a New Way.

An effective plan was used by the Citizens Electric Company, of Hot Springs, Ark., for marketing toy ranges during the last holiday season. The range is distinctly for children and it was to them that the basic appeal of the campaign was made. A non-advertising story of the range was published in two leading newspapers, and a short time later a contest was announced to which all the school girls of Hot Springs were eligible. The announcement stated that to the little girl who sent in the best essay of less than 300 words on the "Advantages of Electricity in the Home," a Western Electric Junior range would be awarded. A number of excellent essays were received.

The contest did more than create interest and selling product—it served to plant in the minds of future housekeepers an interest in domestic electrical appliances and a knowledge of their use which is certain to bear dividends in the sales of the future.

One Way of Gaining the Good Will of the Public



The illustrations herewith show what can be done by a central-station company in the way of improving its surrounding property to make it attractive to the eye. The illustrations show the operator's cottage and a part of the switch-station yard at the Texas Power & Light Company's substation at Hillsboro, Tex. The company's interest in civic affairs as exemplified by its attention to the yard and grounds has won favorable comment from visitors. Local newspapers are always glad to publish pictures of such places and in this way the work of the company can be called to the attention of the public.

ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

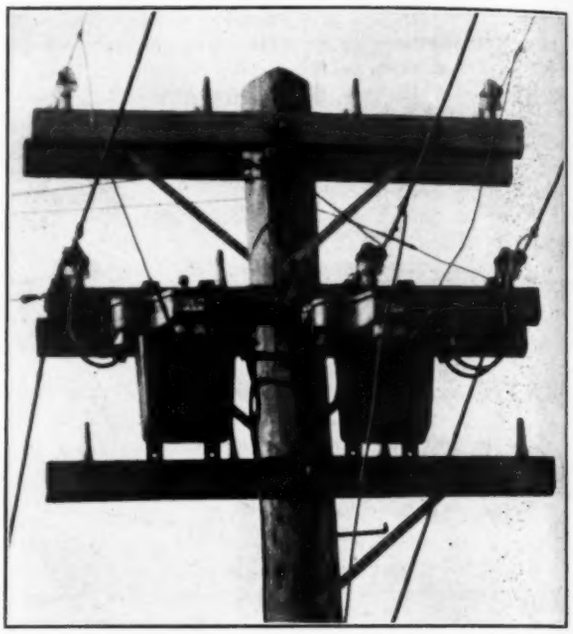
Economical Control for Decorative Street Lighting at Madison, Wis.

The advent of the tungsten lamp less than ten years ago has given a great stimulus to ornamental street lighting which has in the last few years been still further promoted by the development of the gas-filled tungsten lamp. This development has also led to the more general use recently of single-unit standards utilizing large and highly efficient lamps.

For most street lighting series circuits were formerly used. For ornamental lighting, however, where a considerable number of metal standards are used, the advantages of the multiple system have led to its more general use since this avoids the introduction of high-voltage circuits into any part of the lamp post, and also makes it possible to operate the ornamental lighting from the commercial multiple circuits that are found throughout every city. To operate multiple circuits, however, from such commercial lines has necessitated controlling the lamp posts individually. This need for having a patrolman cover the complete circuit, both at the time of turning on and turning off the lamps, has hindered the more general use of multiple ornamental lighting.

The recently completed ornamental street-lighting installation at Madison, Wis., is an excellent illustration of an ingenuous manner in which a multiple circuit may be completely controlled by means of a simple and dependable type of automatic electric switch. The demand for decorative lighting in Madison received its greatest impetus when the State of Wisconsin installed ornamental single-light units around Capitol Park, which is the plot of ground surrounding the new $7,000,000 Capitol structure and from which radiate the principal business streets of the city. Although no other poles except the iron trolley poles obstruct the curb lines surrounding the park, single-light standards were selected as having greater artistic possibilities. As shown in the accompanying illustration, the unit employed is a cast-iron standard supporting a ventilated top which incloses a high-candlepower tungsten lamp fed from the three-wire mains of the State's special Capitol lighting system.

Type of Ornamental Lamp Post Used Around the Capitol and Adopted for Ornamental Street Lighting Throughout Madison.



Method of Mounting Control Switches on Poles in Accordance with Standard Transformer Practice.

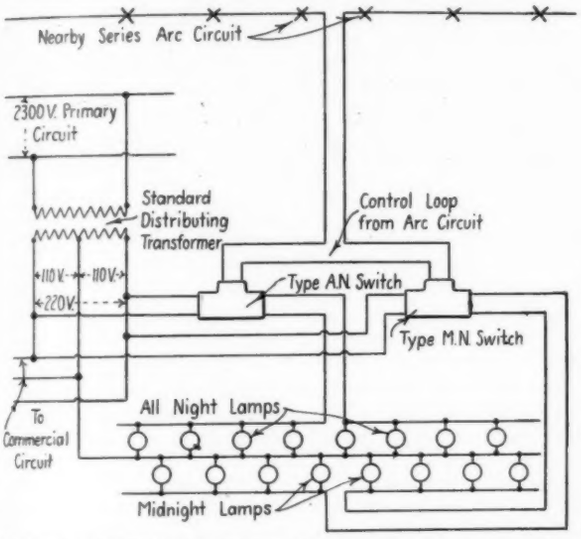
The installation of this special lighting met with such hearty public approval that the city authorities of Madison decided to adopt a similar standard and contracted for the installation of about 150 such units. The details of this municipal installation, which comprises 600 and 1,000-candlepower units, were worked out by an advisory committee consisting of John Glaletti, Jr., of the University of Wisconsin; E. D. Kifer, superintendent of the Madison Gas & Electric Company; E. D. Parker, city engineer, and A. P. Koellen, city electrician. After Mr. Kifer's resignation to take another position in an eastern city, many details of construction and operation were worked out by his successor, G. E. Wagner.

It was decided to lay three-wire mains along each side of the streets to be illuminated and alternate posts were to be connected to opposite sides of the three-wire service. For this purpose steel-armored, lead-covered cable was installed, usually in a slot cut into the concrete sidewalks close to the curb; in some cases the cable was buried under the street paving or, in the case of residence districts, in the parkway between sidewalk and curb. Where the cable was put into the sidewalk, the contractor reduced labor costs very materially by using a motor-driven chisel mounted on a dolly truck which was provided with roller guides so that the channel would be cut at a uniform distance from the curb line. This chisel merely chipped the channel lines on the sidewalk surface, the heavy

work being done by the familiar "whop-maul-chisel" method.

There are many trees and only a few alleys in the city which made it desirable to eliminate or reduce to a minimum special control circuits to the power house. Therefore the original plan contemplated supplying the three-wire special lighting mains from the three-wire distribution circuits of the Madison Gas & Electric Company through the use of clock-operated automatic time switches. Before the installation was completed, however, it was decided to use a new type of remote-control oil switch, which is operated by means of electromagnets, these being connected in series with a loop of the nearest series street-lighting circuits. Use of these switches has made possible control of the special lighting from the power house without necessitating the running of special control circuits. It has also eliminated the need for time switches with their requirement of periodic winding and attention.

The lighting schedule of the new decorative system provides that all lamps are lighted at the same time each evening as the other street lamps throughout the city, the latter being almost entirely series arcs. At midnight alternate ornamental posts on each side of the street are cut out of service, the remaining lamps being cut out together with the series street arcs in the morning. In order to do this and yet maintain at all times a perfect balance of load on the commercial three-wire mains has required 11 control points. At each of 10 of these



Method of Balanced Feeding and Controlling of Ornamental Street Lamps From Standard Circuits Already in Service.

there is installed a double-pole type AN remote-control switch and a double-pole type MN remote-control switch connected in the manner shown in the accompanying diagram. At the eleventh point of control all the lamps are required to burn throughout the night so a type AN switch alone was used.

The details of these switches, which are manufacured by the South Bend Current Control Company, South Bend, Ind., and their method of operation were described in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of July 15, 1916. In general it may be said that the type AN switch is designed to close and open the ornamental lighting circuit at the same time as the series arc circuit which in this case operates the switch. The type MN switch closes at the same time as the arc circuit is closed, but is opened at midnight by momentarily opening the arc circuit. This so-called "winking" of the control circuit does not affect the type AN or all-night switch, but causes the type MN or midnight switch, to open and be locked in the open position for the remainder of the night. When the arc circuit is pulled off in the morning, both types of switches are restored to the normal open-circuit position and ready to close again the next evening.

This simple system of control thus causes all lamps to burn until midnight and automatically cuts out alternate posts after that time. The installation has been in operation several months with completely satisfactory results. The switches are mounted side by side on the crossarms of poles and are mounted in iron cases similar to transformer cases, in fact, the general appearance and method of hanging follows standard transformer practice.

Among the Contractors.

George G. Williams, Newark, N. J., has been awarded a contract for electric work in the Third Presbyterian Church, Broad Street.

The United Electric Construction Company, Philadelphia, Pa., has received the contract for electrical equipment in the new 15-story building to be erected at Sixteenth and Spruce Streets.

The Davis Electric Company, Newark, N. J., has been awarded a contract for electrical work in the new plant to be erected by the American Metal Bed Company in Clifton Street.

The Consolidated Electric Company, Newark, N. J., has been awarded a contract for electrical work in the new structure to be erected by Charles and Thomas Goldingay on Orchard Street, Newark.

R. B. Randell, Randell Electric Construction Company, Kansas City, Mo., reports that business is very good. He recently secured 22 house-wiring jobs in one week beside a number of large contracts he has been working on for some time.

The Snover Electrical Company, Toledo, O., is manufacturing and placing on the market a new invention which will be found of great value to electricians. It consists of a device for securing the smaller sizes of flexible tubing in switch and outlet boxes. A good demand is reported.

The Crescent Electric Company, which recently moved to new quarters at 813 Delaware Street, Kansas City, Mo., reports that it has received the contract for wiring the two-story building at 110 East Missouri Avenue, and is also wiring the First National Bank Building which is undergoing complete remodeling.

The LaFrance Electric Company, Toledo, O., has completed the wiring for the new factory of the Doehler Die Castings Company, including light and power equipment. The wiring contract for the new South Side Carnegie Library has also been awarded to this firm. The LaFrance company reports business excellent and the firm is contemplating a removal to larger quarters.

The contract for electrification of the plant of the Brinly-Hardy Company, implement manufacturer at Louisville, Ky., has been awarded to the Bland Electric Company, of Louisville. The job includes the installation of 11 motors. One of the largest lighting contracts of the fall has also been secured by the Bland company. It is for 180 lights in the new addition to the Liggett & Myers tobacco plant.

The Columbia Electric Engineering Company, of Boston, Mass., has the following contracts: Eight-story concrete building at Kneeland and Tyler Streets, the contract calling for complete lighting installation, including fixtures, two electric elevators and telephone systems; the Perry Buxton Doane Building, South Boston, for lighting equipment, elevators and motors; the Tech Block, Cambridge, Mass., consisting of 15 stores and offices; the Reservoir Garage, Beacon Street, for the entire electrical equipment, including elevator and pump motors and lighting fixtures; the Webb Garage, Warren Street, Roxbury; the Osgood school, Medford, and the North End Union Building, Boston.

Installing Lighting Plants in Small Villages

Opportunities of the Electrical Contractor in Securing Profitable Business From the Installation of Small Lighting Plants—How to Go About It

By W. A. Magee

DURING the past three or four years the use of small electric lighting outfits with storage-battery auxiliaries has become quite general on farms and in cross-road communities, and these have opened up a good field for the electrical contractors in the smaller cities. Some of these contractors have developed this field so zealously that it has become their principal business.

It was probably natural that this idea would be expanded so as to include the use of similar but larger plants in communities of 300 to 600 people where the alternating-current system could not be operated on the small revenue possible in these towns.

Nature of Service To Be Given.

While not as important in a financial way as the regular type of public lighting station, this field of electrical activity opens up some problems in engineering quite distinct and interesting. Continuous service every day and night throughout the year is to be given, at a cost of five cents per kilowatt-hour or less, this including cost of fuel, attendance, incidentals, 8 per cent for depreciation and 8 per cent for interest on the investment. This is to be done, remember, not with large efficient units and skilled engineers, but with plants totaling 8 to 15 kilowatts, and with such attendance as can be had in the village at $30 to $40 monthly. To the ordinary solicitor for power and lighting this would seem like child's play, but these plants when installed become regular users of lamps, fans, small motors, and will in time become worth while to the manufacturers of these devices.

Character and Cost of Plant.

The writer has installed some of these "toy plants," using kerosene engines of 10 to 20 horsepower, and direct-connected generators of 6 to 15 kilowatts, with 55 cells of storage battery of 80 to 150-ampere-hour capacity.

The cost of station equipment has ranged from $900 to $1,550 and of building and outside distribution from $400 to $950. So far it has always been possible to obtain the use of telephone poles already in place. In each case the revenue was proven to be sufficient for maintenance before contracts for apparatus and installation were signed.

It is usually a hair-splitting proposition, but so far in each case the revenue has exceeded expectations and expenses were never higher than shown. These rural communities have to be figured in their own way and would be the despair of the usual plant promoter. The small amount of capital to be invested simplifies the closing up of the deal after preliminaries are figured out, if you have chosen favorable prospects. This is the first thing.

While many such villages are close enough to larger places to justify a transmission line, yet there is undoubtedly a large field for installation of these plants and this work is not confined to the large engineering firms, but can be assumed by almost any electrical contractor. Bear in mind that it costs about $800 per mile to put up a transmission line and that the power rate will be nearly as much as it costs to generate on the spot. The small amount of revenue is not very attractive to the larger plant where power must be generated from coal at $2 to $3 per ton. Of course, it is by no means certain that one can march into a village, spend a day or two and walk out with an order. Some cases will be difficult, some easy, and some impossible.

Suggestions for Getting the Business.

A few suggestions may help the contractor who wants to try for this business. Select a suitable town, preferably on a railroad, with a population of 300 to 500 or 600. As most towns of 600 and over already have a lighting system, you are not likely to find a town larger than 600 population not already supplied.

If the owner and operator of the telephone exchange is a resident, so much the better. His poles will save that much capital, if they can be used. Talk to the cashier of the bank; if there is more than one bank, try to find out which bank the telephone man does business with and talk to its cashier. You may get these men together. Of course, the cashier will tell you it won't pay. It's a banker's business to be conservative.

Estimated Income.

Take a walk around, count the business places, then count the best residences. You could probably get half the business places and half the residences to start with. Now, do not imagine these stores are going to give up $15 to $40 each month for light. Estimate them at $5 and residences at $1.50 each. You can usually bring up an estimated conservative revenue from these sources of $75 to $100 a month.

This, of course, leaves out the street lighting and it is well to leave this out in your estimate, merely mentioning it as an additional revenue. If you succeed in interesting your parties, leave a little figuring for them to do. You might suggest that 10 or 20 street lights at $20 per year each might be obtained. If the deal goes through, your friend, the cashier, knows how to get the council or village board better than you do, although he may send you around to talk to the members later.

Estimated Costs of Operation.

The average nightly run of the engine with storage-battery auxiliary will be five hours, and a kerosene engine will use five pints per horsepower in that time. For a 10-horsepower engine this will mean 6.5 gallons per night or 195 gallons per month, which, at 7 cents, makes $14 monthly. An operator in these small places can be had at $40; repairs and incidentals will run about $10, making $64 to cover actual monthly plant expense.

Meters may or may not be used. In these small communities it is necessary that a certain revenue come in and a flat charge based on service is desirable. At the same time, wasteful extravagance in use of current can be corrected. It is safe to wire up twice station capacity.

Tactful Preliminary Investigations.

Now we will suppose that you have visited your little burg and find that for some reason the telephone man cannot be directly interested. The cashier of the only bank in the town shakes his head, "Yes, it might be a nice thing, but you can't do anything like that in this town." Get his reasons. Perhaps it's only a notion.

Perhaps he will tell you that Jones will do his best to "bust" up anything Smith approves. Smith would put in his own plant rather than patronize anything Jones is in and each had his followers. With all their petty bickerings and splitting up, their trade is going to a larger town nearby and they are so consumed with ideas of revenge on each other they can't see why. Get out of that place as quick as you can. You have already wasted too much

time and money there. There are not many like this, but spot them as quickly as you can.

Suppose, however, the cashier merely says that "it will cost too much money and won't pay"; perhaps he will cite in proof that Cedarville, ten miles away and twice as big, spent $4,000 for a plant and has never made expenses on it. Ten chances to one, Cedarville, with 800 people, has a 30-kilowatt alternator driven by a 50-horsepower steam engine, gives service only from dark to midnight and can't get enough load to keep the belt tight. Nowadays, 30 kilowatts will furnish current for 1,500 20-watt lamps and can be wired up for 3,000 lamps. This is big enough for a town of 2,500.

Now take these facts and the salesmanship. You can install a plant for about half that sum, give service every minute of the year and with the revenue you estimate can be realized, can pay all expenses and have enough left over to pay good interest. He will doubt this, so cite him towns already doing this and ask him to write and verify for his own satisfaction. If you get this far, you have made a good start.

Now size up the stores and residences and step off the distances for approximate cost of distribution. There is probably a little garage right near the center of the village. Get acquainted. If the garage man is the right sort, he may be the man to operate the plant and, if he and the cashier are friendly, he may be of service.

Progress of the Negotiations.

There is no standard method for presenting your proposition, having it accepted, and getting the contract. While experience has shown that men in certain lines of business are the most easily approached, yet in some cases they can not be used at all and judgment and patience and initiative are necessary. It is well, of course, to talk only to those whom you want to interest and, if possible, get the party to whom you are talking in a corner, away from the loungers who are invariably loafing about in these country places. Talk at first only in a general way and do not make a proposition, merely assuring the party that the plant can be put in for much less than he thinks and that you expect to prove to him that it will pay, if he will interest himself.

On one proposition that had been working seemingly quite satisfactorily, something developed that showed it was not going through on the basis planned and, somewhat disappointed, the promoter-salesman felt that he would have to abandon the project, when a young fellow of 18 or 19, who had always seemed to be listening in whenever the salesman tried to talk and who had been considered a nuisance, asked, "Why, do you have to have a coal-oil engine?" He was a student, an "amateur electrician," and his "dad" owned the flour mill. Between the "dad" and an uncle, who owned the telephone system, and the "kid," who had $400 of his own, the deal was fixed up within three hours on an entirely new basis, after the case had seemed hopeless. The plant was put into the flour mill, and with wood at $1 per cord was just as cheap as kerosene. After we had the plant running, the mill man winked and said, "Guess that will keep the 'kid' out of the pool hall."

After getting your parties together and reconciling their different ideas, make one proposition and hammer on that until it is accepted or rejected. If rejected, make another proposition. The apparatus to be used must be described fully and, if one or more of your company think it should be larger, show that your apparatus is ample and the capacity can be doubled whenever necessary without sacrificing what is already installed.

In a critical case, where it would seem that all your inducements do not bring the desired result, drop a hint about a moving-picture show. Usually the parties think of that themselves and have it up their sleeves.

In every case, get them to furnish the engine. If asked, you may mention some you know to be good, but do not have the engine in your contract. Stipulate the power required. There is always a local dealer who will gladly quote and sell them the engine and take an interest in its performance. Sell only your electrical apparatus, generator, batteries and switchboard all set up and ready for operation. Even if you cannot interest the telephone man, he can probably be persuaded to allow the use of his poles on a yearly lease of $40 to $60. He will probably put the wire up for $3 per day and get it all up in 4 or 5 days. Estimate the load on each lead and list the amount of No. 6, No. 8 and No. 12 wire needed and get one of your company to buy the wire, as he can get it as cheaply as you can. (There is no profit in selling weatherproof wire.) Have the weight required of each size, figure it all up and add $50 to it in making your estimate. If one of your company is a merchant or a telephone man, he may go to his office, figure up the cost of the wire and he will find that $50 and help you.

Drawing Up the Contract.

Now make out a proposition in duplicate, using a sheet of carbon paper. Write it while they are there. When it comes to name, ask (keeping on writing), "No need to incorporate, is there?" They will probably say, "No, guess not." "Shall we call it Waterview Lighting Plant?" That will probably be all right; go on and make out your proposition and specify everything you are to furnish and sign it. Then pass it around for them to see. If they make no criticisms or corrections, get them to O. K. it and sign it. This, then, becomes a contract, but possibly, if you had mentioned contract, some one would have suggested delay. Being a partnership, each one is liable. The only reason for preferring partnership to corporation is that it would mean delay and possibility of something else coming up. So clinch it at first chance.

Take your contract to a jobber and have him furnish the apparatus; sign over to him an order for the payment of full amount of the order. This will protect the jobber. If the jobber knows you, he will probably not present the order for collection but allow you to collect and remit to him. After deducting the cost of apparatus from the amount of your contract, the jobber gives you a check representing your profit.

If you cannot get your people to get the wire themselves, take their order for it, but stipulate that, as this is merely an accommodation, you will have it shipped draft with bill of lading, as you do not want to tie up cash in it.

Wiring Jobs.

After apparatus is bought and waiting for arrival, get wiring jobs. You can probably do $200 to $300 worth before the plant starts. Put one good wireman at the whole business and take a couple of the village boys as helpers. Make these jobs pay. Send up a few fixtures and hang them up where they can be seen. You can probably sell $200 to $300 worth, mostly low-priced and medium. Do not try any fancy stunts. Remember, every one of these customers has a mail-order house catalog. Don't mention any terms in making your prices, but present your bill the day after each job is done.

The methods suggested are not infallible, but are usually the most satisfactory. Allow nothing in your dealings with your "lighting company man (or men)" that can make a loophole for delay in settlement, for it will surely be taken advantage of. Instead of the jobber financing the apparatus, you may do it yourself or at your bank.

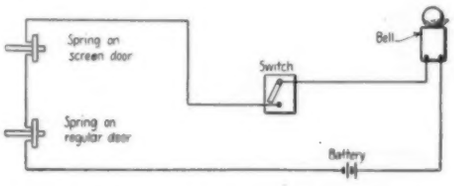
After you have one or more plants in satisfactory operation to refer to, you may arrange with your parties to pay cash on arrival on a five per cent cash basis. This looks big, but it is worth it, if you may get to handle several jobs at the same time.

DOLLAR WIRING KINKS

Every reader is invited to contribute to this page. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Store-Door Alarm.

Recently I had occasion to install an alarm bell to announce the entrance of customers to a store. It was necessary to have the alarm operate both from the regular door and from the screen door just outside. The arrangement was such that one door is always open while the other is closed. During the day and early evening the regular door is open and the screen door closed. On cool days or evenings the regular door is closed and the screen door kept open. It was required that no connections be changed when one or the other door was in use. The matter was



Series Arrangement of Door-Alarm Contacts.

arranged by installing two regular open-circuit type door contact springs, one on each door, and connecting them in series in a circuit with battery, bell and switch, as shown in the sketch. This series arrangement has been found to work very satisfactorily, although at first thought one would believe a parallel arrangement was required.

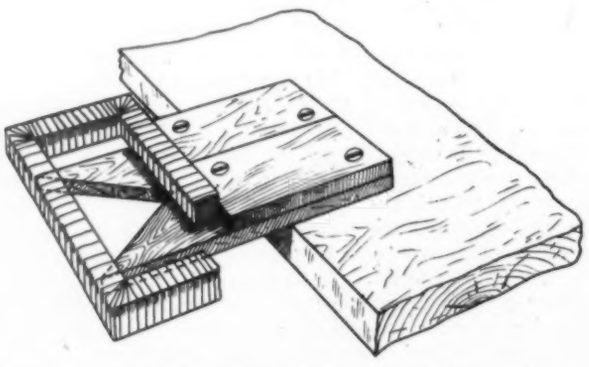
John J. Carl.

Removing Grease Spots from Marble Switchboards.

In the issue of October 28 there was published a plan for removing oily spots from marble by means of gasoline-soaked waste applied with pressure. I have always used for this purpose a simpler and, I believe, better method. Take plaster of Paris and benzine and make up a fairly stiff paste of the mixture. Apply this to the oily spots on the marble in any position. Brush off after several hours and the spot will be gone. J. B. Reid.

A Coil-Taping Support.

When taping a round or rectangular coil of wire such as a field coil or a transformer coil it is often difficult to pass the tape over the side and through the center. The work and time consumed can be lessened by setting the coil on a piece of board with an opening cut in its end and allowing it to extend beyond the work bench, as shown. This arrangement permits the coil to be freely moved, the center of the coil being kept open all the time so that the worker will be enabled to obtain a view of the larger portion of the surfaces to be taped. R. L. Hervey.

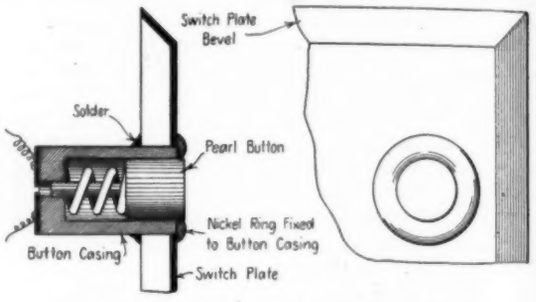


Convenient Coil-Taping Support—Part of Coil Broken Away to Show Arrangement of Boards.

Neat Mounting of Push Buttons on Expensive Desk.

The problem was recently presented to me of mounting eight push buttons neatly on a fine mahogany desk in an up-to-date office. Eight miniature flush push buttons were pressed into the holes of a four-gang switch plate and held there by a drop of solder on the back side thereof. After the connections were made the plate was mounted with nickeled wood screws, one-half-inch holes being cut for the button recesses.

G. M. Rogers.

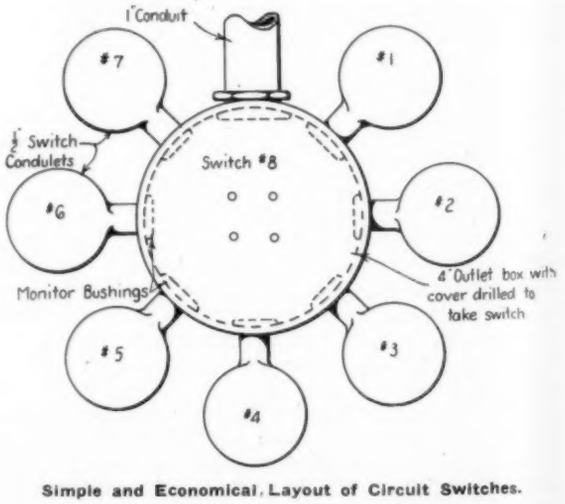


Neat Mounting of Buttons on Mahogany Desk.

Simple Layout of Circuit Switches.

In exposed conduit work where a set of switch Condulets has to be installed, difficulty is often encountered owing to the large number of wires that have to be pulled through some of the fittings. The plan outlined in the sketch herewith does away with this disadvantage and at the same time allows the use of one-half-inch fittings throughout. This plan is particularly useful in garages, warehouses, etc., where appearance is not of so much importance and space is often limited.

There are only two wires in each Condulet and ample space in the box for loops, taps, etc. The switch Condulets are secured to the box by means of nipples, locknuts and monitor bushings. An eighth switch can be mounted on the cover of the box which is drilled for this purpose. John Shortt.



Simple and Economical Layout of Circuit Switches.

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"LET THE CODE DECIDE."

Secretary's Message.

The Secretary regrets very much that he has not been able to get material together sooner for this department. Two things caused this: First, on account of the poliomyelitis situation it seemed inadvisable to bring young children home from a place of perfect safety in Maine so that the Secretary, instead of returning home September 11 as planned, did not come till a month later, but made weekly trips back and forth, keeping matters going at both ends as best he could, and then when his household goods were finally expressed from South Orrington to Concord one box of books, etc. (in which was his Association matter), went astray, finally being traced to Concord, N. H., and was only returned to him October 28.

Two active members of the New York Section, Richard D. Weeks, and Everett H. Eddy, died recently, only a few days intervening, between them. Both were inspectors of the Department of Water Supply, Gas and Electricity and attached to the Queens Borough office.

No information as to winter plans has come to hand from California where, however, we know they are very much alive, nor from Philadelphia.

The Secretary wishes to call the attention of every member and especially the Section secretaries to the fact that *now is the time* to consider any desired changes in the Code, because if they are to be formally presented to the Committee by the Association representatives next March, they must be discussed in section meetings (unless offered by a member at large), approved by same, and forwarded to me that I may send them to each member of the Executive Committee and get them back with the members' votes thereon in time to get them into shape to forward to Mr. Sweetland, so the whole matter may be off my desk for good by January 1. It will be seen that the time is short and the members and sections should attend to the matter promptly.

The Secretary recently received from Secretary Oswald of the British Columbia Section a very interesting letter in which he stated that plans for the winter were being worked out and inclosed a copy of the scheme of examination for motion-picture operatives which seems of sufficient general interest for printing here, and with which Mr. Oswald has much to do.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

British Columbia Examination for Motion-Picture Operators.

In accordance with the provisions of the Moving Pictures Act Amendment Act, 1916, all persons desirous of securing, after January 1, 1917, a license to operate moving-picture apparatus and its connections in British Columbia will be required to pass an examination as to competency. This examination will be given at the Examination Room, office of Censor of Moving Pictures, Court House, Vancouver, B. C., by the Board of Examiners appointed for the purpose. For convenience, examination of those desirous of securing 1917 licenses will be undertaken during the month of December, 1916. Those who wish to take the examination will be duly notified as to date and time to attend before the Board of Examiners.

This notice merely calls attention to the forthcoming examination which will embrace detailed information under the following heads:

Electrical—30 per cent allowed. Systems of transmission, sizes and insulation of wires and cables; house wiring systems. General knowledge of generating, transforming and rectifying devices and rheostats and care of same. Testing and tracing of circuits for voltage, opens, shorts, grounds, etc.; connecting lamp circuits from source of supply to lamp through line resistance, rectifier, motor-generator, etc. Lamp house, arc lamp—connections and faults.

Mechanical—30 per cent allowed. Machine head—Specific knowledge of its component parts, their uses and adjustments; care and renewal of parts. Various styles of intermittent movements, their adjustments and qualities. Safety devices, their action and care. Threading, framing, focusing, etc. Revolving shutter, its principle and application.

Optical—20 per cent allowed. Condensers—Types, mountings, adjustment, focusing, care, etc. Projection lens—Construction, selection, use and care. Ability to secure and maintain clear field on screen; ability to hold picture in focus and maintain maximum amount of light on screen.

Safety—20 per cent allowed. Knowledge of safety appliances connected with projection-machine operation. Auxiliary safety appliances, their use and care. Construction of operating rooms; installation of electrical equipment therein; ventilation, etc.

Meeting of Western New England Section.

The regular October meeting of the Western New England Section was held at the Pond House, Elizabeth Park, Hartford, Conn., on October 10. At the morning session A. W. Hopkins presided. Guy E. Beardsley, president of the Board of Fire Underwriters, made an address of welcome. He referred to the tact and diplomacy necessary in carrying out inspection work and announced that the day was the fortieth anniversary of the entrance of Thomas H. Day into electrical work on the Battleship *Tennessee*. He gave a sketch of Mr. Day's career. L. N. Heebner responded. Suggestions for changes in the 1917 Code were then considered.

The principal topic of the day was a discussion on "The Use of Plated Iron and Steel in Wiring Devices." This was taken up at the afternoon session, at which Thomas H. Day presided. Dana Pierce presented the viewpoint of the Underwriters' Laboratories, while H. T. Paiste spoke for the manufacturers and A. W. Hopkins, of Springfield, Mass., for the electrical inspectors. The discussion which followed was participated in by Shiras Morris, of the Hart & Hegeman Manufacturing Company; F. T. Wheeler, of the Trumbull Electric Manufacturing Company, and F. L. Ferguson, of the Hessel-Hoffman Company. Mr. Pierce also gave an address on the work of the Electrical Department of the Underwriters' Laboratories.

During the noon hour there was an exhibition of defective devices and of infractions of Code rules. The next meeting will be held at the City Hall, Northampton, Mass., on January 10, 1917, when it is expected that W. J. Canada, of the Bureau of Standards, will make an address.

Supplementary Answers to Previous Questions.

There have been received, since the last matter was forwarded to Chicago, for these columns, three sets of replies to the last bulletin of questions and below are given supplementary replies to Questions 331, 332, 333 and 334.

Grounding on Water Pipe.

To Question 331 M replies: Strictly speaking it is a violation of the Code. However, in the practical application of Rule 15*g* it may be more feasible to ground the water pipe and connect the jumper around the water meter than to run to the street side of the meters, main cock, etc., referred to in the rule. This is distinctly a case where the inspector should insist on the best construction to meet the specific case.

Y and X reply jointly: It is a violation which should not be permitted if possible to avoid it.

Grounding of Underground Service Conduits.

To Question 332 M replies: Rule 12*f*, third paragraph, applies in the case of an underground service conduit coming from a service pole; it has been our belief that it does not apply to an underground distribution system, our reasoning being based upon the specific recommendations in Rule 17 of the Code to underground conductors and the assumption that Rule 12 refers only to overhead wires.

X and Y reply: (1.) Underground service from a pole line should be grounded permanently outside building and pass directly to service cabinet and be bonded thereto. (2.) The interior conduit, metal molding or armored cable should be thoroughly bonded to the underground service of an entire underground system, which is by nature permanently grounded.

Side-Wall Protection.

To Question 333 M replies: In an installation where it is permissible to use wires having slow-burning insulation we should consider as satisfactory the use of iron pipe for side-wall protection where the wires are separately incased in flexible tubing.

X and Y reply: If the installation made the use of slow-burning wire necessary, the use of iron pipe for side-wall protection would be allowed.

Switchboard Equipment.

To Question 334 M replies: Rule 7*a* requires that ground detectors be provided on all circuits except such as are properly grounded in accordance with Rule 15, but the use of both meter and pilot light is to be optional, although it is standard practice to use them.

X and Y reply: Rule 3 does not mention that a switchboard must be equipped with pilot lamp, voltmeter or ground detector, but Rule 2*e* implies the use of same. Standard practice is to install pilot lamp and voltmeter at least. Rule 94, on marine work, demands the installation of at least voltmeter and ground detector.

Pilot Light for Iron.

Question 335. Is it necessary to install a pilot light on a six-pound 110-volt flat iron in a millinery shop?

Answer 1(X and Y). Rule 25*a* calls only for either an indicating switch or an indicating plug.

Answer 2(M). Rule 25 does not now require a pilot lamp on a flat iron or other non-luminous type of heating device, although experience proves almost daily that a pilot light on these devices is highly desirable.

Answer 3(V). No, it is not.

Answer 4(K)*. Not under the Code.

Answer 5(E). There is no rule in the Code providing for the use of a pilot light in such a case. We do not feel that a pilot light would prevent a fire, as the writer has investigated several cases where a fire occurred and a pilot light was installed. A plug in a socket is just as much a warning as a light.

Answer 6(O). It is *always* wise to provide a pilot light on any outlet used to supply an electric iron. The pilot light is not, however, required by the present Code rules.

Answer 7(S)*. The Code does not require it.

Answer 8(B)*. The Code does not require a pilot lamp in connection with such an iron whether it is installed in a millinery shop or anywhere else.

Answer 9(H)*. The Code does not require a pilot lamp installed on a flat iron as noted, but it would seem good policy to install one neverthless.

Answer 10(P)*. No.

Answer 11(N). The Code does not require it. I have had three cases in my small territory within the last five months, however, in each of which a pilot light would have prevented a fire loss. None of the three cases involved over $50 loss, but in each case it would have paid for the pilot light many times over. One will illustrate. An outlet installed in a kitchen was meant for both light and alternative use of iron. At 5 p. m. the lady of the house disconnected the lamp, put in the iron on a long cord to a table in the dining room and did a bit of work, turned the key and went to a church sociable. The husband came home at 6 o'clock, went into the kitchen in the dark, and turned the switch. As no light resulted, he left the switch turned, felt his way to the closet, there lit a match, got what he wanted and went off also to the sociable. Smoke was smelt later outside, an entrance effected and the fire extinguished after it had burned through the table top. The installation of a pilot light would have saved the whole thing.

QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be submitted preferably within eight days of the date of publication of the question and should be limited, if possible, to 300 words. Payment will be made for all answers published.

Questions.

No. 367.—National Electrical Safety Code.—Will the new National Electrical Safety Code bring about the creation of municipal electrical inspection in order to enforce its provisions in those cities where there is now no city inspection?—G. H. F., Rockford, Ill.

No. 368.—Electricity for Sewage Treatment.—Has electricity been used successfully for sewage treatment? In what process is it used most effectively? How much electric power is used per million gallons treated? What portion of the total cost of treatment is the cost of electric power?—R. H. T., Lima, O.

No. 370.—Electric Air Heater.—Will some one kindly give me directions for making an electric air heater that will warm or take the chill from a room 10 by 12 feet? The heater is to operate on 110-volt, 60-cycle, alternating current. I do not care about the looks of the outfit, only the service.—F. M. G., Deferiet, N. Y.

No. 371.—Grounding of Delta System.—In a delta-connected, three-phase, secondary distribution system using 110-220-volt, three-wire distribution from each phase what is the established practice regarding grounding of the system? Ordinary 110-220-volt, three-wire distributing systems have the neutral grounded. However, in a three-phase delta system, if the neutral of each transformer secondary were grounded, there would be a circulating current through the ground from each transformer to the other two, due to the 110-volt delta potential. It seems to me as though this kind of a system would have to have only one point on one of its three phases grounded, or else be left ungrounded entirely.—F. E. A., Fort Collins, Colo.

Answers.

No. 360.—Meter Troubles from Lighting.—We have been put to some expense and trouble on small two-wire direct-current meters through lightning striking our direct-current overhead lines and going into these meters. We would like to know whether there is any approved provision for taking care of lightning on such direct-current lines and what experience other central stations have had in this matter.—W. J. A., New Orleans, La.

The lightning troubles experienced by querist are shared by many companies, in fact most companies whose systems are situated in zones susceptible to lightning, although, of course, the damage done is of varying degree. Protection is entirely feasible, but in practice is not generally considered worth while. Lightning is seasonal and variable in intensity and frequency of attack, hence quite a heavy investment might be necessary for only a small return in the form of protection. This same subject came up before the National Electric Light Association about two years ago (Question Box, *N. E. L. A. Bulletin*) and my recollection is that the consensus of opinion expressed therein was to the effect that while burnt-out meters from lightning were a more or less common occurrence, the number of meters thus damaged was too slight to warrant the expense and other disadvantages of taking protective measures. To be worth while financially, a lightning arrester must be capable of saving an expense represented by the cost of removing, repairing and reinstalling a burnt-out meter plus a certain definite charge for service interruption, which includes loss of income to the company. Under ordinary circumstances there is no arrester available at a price which will permit this.

There are other factors to be considered, however, besides that of whether or not such a protective device is financially justified. Often the space available does not offer favorable opportunity for the installation of an arrester, and its installation might easily introduce friction between insurance interests and the central-station company. The question of safety to those living and moving in close proximity to the arrester must also be considered. Such an arrester should be fused, otherwise many service interruptions would probably be chargeable to the arrester, whether from arcing across at the time of lightning discharge or because of insects, animals and other obstructions closing the air gap.

The cost is undoubtedly the chief obstacle preventing the use of an arrester as proposed, while the additional space requirements, annoyance, etc., also act as deterrents. In the endeavor to reduce overhead charges and still further lower the cost of electrical distribution and utilization by the small consumer attempts are being made to use concentric wiring, eliminate the house meter, etc., and other economic measures. The use of an additional piece of apparatus would therefore hardly be looked upon favorably, unless it were absolutely necessary.

To the writer's knowledge, no lightning arrester is especially made for protecting the shunt coils of wattmeters. Existing apparatus can, however, be used, and will offer partial, if not nearly complete, protection. The air gap, as exemplified by two pieces of hack-saw blades spaced about one-eighth inch or less apart, is used for telephone protection in many cases.

A condenser or the vacuum arrester, originally designed for the protection of signal circuits and apparatus, and later used for protecting secondary wiring from electrostatic and inductive effects of wireless stations, also should prove efficacious. For an arrester to be effective the connection between it and ground should be as direct as possible and the impedance and ground resistance low. A water piping system offers about the best "earth" possible, and should be used wherever feasible, although it is not difficult to imagine the possibility of difficulties arising between landlord and central-station company where a company made it a practice to install lightning arresters with every wattmeter. Without a good ground the most costly arrester would be useless.

I believe the general opinion of companies in this matter is that a small outage cannot be prevented and must be taken as a matter of course.—K. R., Chicago, Ill.

The writer has encountered the same trouble as described. Practically the only method which he found for the protection of the direct-current meters on the system was a complete and thorough installation of lightning arresters and good grounds. A record was kept of the points which seemed to be the most susceptible to lightning. Then lightning arresters were installed at these places, or as near them as possible. Particular pains was taken to insure a good connection to ground for these. A hole was dug to a sufficient depth to always be moist and charcoal was placed in the bottom. Then a copper plate or coil of wire large enough to insure good surface contact was put in with soldered connection running to the surface, and the hole filled up with earth. Kinks and turns in the wire from the arrester to the ground were avoided. If permanent moisture in the ground is not assured, it is a good plan to place a pipe in the hole, running to the surface, into which water can occasionally be poured.

An inspection of arresters and grounds in a locality particularly affected by lighting will sometimes disclose the reason for these not giving proper protection. Arresters with movable parts should be cleaned out at regular intervals with a bellows, and tripped by placing a small conducting point across the gap to ascertain that they are in working order. The writer in his experience has found both Garton-Daniels and General Electric magnetic-blowout types to be quite satisfactory.—F. E. A., Fort Collins, Colo.

No. 365.—Noise on Telephone System.—A small private telephone plant with 75 telephones is used for a credit system for charge accounts in a large store. It is operated on a small 55-volt generator. Usually there is very aggravating noise on the lines, being at times so great that it sounds as if there were insects fluttering in the head receivers. What is the cause of this? Could it be overcome by installing a storage

battery? If so, how many cells would be required and how should they be best charged from 110 volts direct current?—J. S. B., Chicago, Ill.

It is extremely likely that the annoying noise has its source in the generator. Machines for low voltages have generally a small number of commutator bars per pole, which means that the electromotive force across the terminals is not exactly constant but of an oscillating character. These oscillations are transmitted into the lines by the brushes of the machine and, if they just happen to be in the neighborhood of the period of resonance of the receiver, will produce by induction very disturbing noises which under certain conditions can be further aggravated by the sliding noise of the brushes if these do not run very smoothly.

Whether the noise is due to this reason can perhaps be tried out by varying the speed of the generator, if possible, and observing how the noise changes. A remedy will be difficult to find. In a similar case the writer once minimized the noise by interconnecting a simple reactance between generator terminals and line which absorbs the oscillations to a great extent. The reactance was made up of about 25 turns of cable wound on a solid round iron core about three inches diameter. The resistance of the cable was too low to cause an inadmissable voltage drop.

If this should prove the true reason of the trouble and no other outside sources can be the cause, then the best and only remedy would be the replacement of the generator by a storage battery. For 55 volts, 26 cells would be sufficient. At the beginning of charge, $110-(26\times2.1)=55.4$, and at the end of the charge $110-(26\times2.75)=38.5$ volts has to be absorbed by a resistance in series with the battery. As the capacity is not mentioned in the question and probably is not very large, this would be the simplest way and involve the smallest cost. For larger capacities the battery could be split into two parts and both parts connected in series for initial charge and for fully charging the two parts are again put in parallel with the resistance in series. But this requires a more elaborate switching arrangement with higher installation costs. The resistance must anyhow be provided in order to regulate the charging current from the constant-voltage supply. By charging at night when the telephones are not in use, the danger of noise from the charging circuit is avoided.—H. A., Pittsburgh, Pa.

No. 369.—Safe Wiring of Bathroom Fixtures.—I have just read of a fatal accident attributed to electric shock obtained by touching a bath-tub faucet and an electric fixture at the same time. What method of wiring bathroom fixtures is a positive safeguard against such accidents? Is perfect insulation of the entire fixture better than complete grounding of its outer metal parts?—D. T. B., Chicago, Ill.

The Department of Public Safety of Cleveland, O., requires the use of porcelain sockets in any places subject to dampness, such as in basements, over concrete floors, and in general in locations where the person operating the socket can be easily grounded. As an added precaution, we suggest that the wire which is connected to the screw-shell part of the socket be effectively grounded to the water pipe system. We cannot require this under our present Code. Installations such as outlined above will, we believe, be perfectly safe.—E. W. P. Smith, Cleveland, O.

In Omaha we have an ordinance which requires that bathroom fixtures within reach shall be provided with porcelain sockets and have their outer casing permanently and effectively grounded. This law, while affording a large measure of protection against the danger of electrocution, has not proved wholly satisfactory in operation for the reason that there is no reliable method of securing a ground connection that is not subject to mechanical interference.

As opposed to grounded fixtures, whose safety-factor depends upon conditions exterior to the fixture itself, I would recommend fixtures having their outer casings constructed of insulating material as a practical and reliable method for securing immunity from such danger. In the case of new installations, an equally satisfactory result can be obtained by installing the bathroom fixtures out of reach and providing them with insulated-chain pull sockets, or by controlling them from wall switches located at a safe distance from water pipes.—F. P. McG., Omaha, Nebr.

The best method of safeguarding against such accidents as described by the querist is the thorough and careful insulation of the fixture. If the fixture were grounded, there would then still be danger of trouble from short-circuits within the fixture causing damage to the fixture, the blowing of fuses, and possible fire. The National Electrical Code in Rule 30a requires that fixtures installed on a conduit, armored-cable or metal-molding system be insulated from the ground, unless the wiring of the fixture have an insulation equivalent to that of the rest of the system. This condition is seldom fulfilled in ordinary fixture wiring, so it is obvious why grounding is not generally recommended. The fixture should be carefully wired, installed and tested, and then there is little danger of accidental connection between it and the wires.—F. E. A., Fort Collins, Colo.

The only positive safeguard against electric shock in bathrooms under certain abnormal conditions is not to complete the circuit between the charged object and the grounded water pipe system, which incidentally constitutes the best ground possible. The grounding of one side of the secondary of transformers offers a safeguard against primary or high voltages entering the building should the transformer break down between primary and secondary or any other condition arise by which high voltage is imposed upon circuits nominally at low voltage, because when this happens the fuses blow and the wiring in the house becomes isolated. While this precaution is efficacious against the really high voltage, it is useless in those cases where an insulated fixture becomes charged by the ungrounded conductor and a person then completes the circuit between this fixture and the bath, that is, the earth.

The question then is whether it is better to insulate the fixtures in bathrooms—likewise those above kitchen sinks and similar places in close proximity to water pipes—or to ground them solidly. If a fixture is grounded, it is then at the same potential as the water pipe, and should it become charged a short-circuit occurs and the fuses blow immediately. While annoyance is caused, of course, attention is forced to the matter, the trouble cleared and the possibility of electric shock being suffered is eliminated. When a fixture is insulated from ground, as mentioned above, the case is different. It may be alive or it may be earthed through the grounded side of the transformer secondary, depending upon which conductor is making contact with it, or it may really be isolated. In either case the persons using it do not know unless they take steps to determine the conditions of the fixture, and in so doing the result may be fatal.

It is not only the stationary fixtures which constitute a danger, but even more so the portable appliances, such as electric radiators, vibrators, etc., for these may be placed in such close proximity to the bath or its equivalent that contact may be made between them and the water pipe with the greatest ease. The exposed parts of such appliances could, of course, be grounded by connection to the grounded conductor where it enters the appliance, but so doing would in the majority of cases require special tests at the time of their installation, unless special polarized terminals were employed or wiring practice became standardized in this respect. Were concentric wiring used, the matter would be extremely simple.

Fixtures should be made as safe as possible, they should be connected so that should electrical contact occur between them and charged conductors fuses will blow, and the public should be advised not to place themselves in such positions as will complete a circuit between electric fittings and the water-pipe system. One of the first steps toward this end is to forbid the installation of non-insulated chain sockets in bath-rooms, or at least restrict them to such locations where it is practically impossible to operate them while touching the water-pipe system.—I. L. K. R., Chicago, Ill.

BOOK REVIEWS

"Mechanical Engineers' Handbook." Prepared by a staff of specialists. Lionel S. Marks, editor-in-chief. New York: McGraw-Hill Book Company, Incorporated. Morocco, 1836 pages (4½ x 7 inches), fully illustrated. Supplied by the Electrical Review Publishing Company, Inc. for $5.00.

The editor-in-chief says in the preface "it is no longer possible for a single individual, or a small group of individuals, to have so intimate an acquaintance with any major division of engineering as is necessary if critical judgment is to be exercised in the statement of current practice and the selection of engineering data." This handbook is thus the result of the combined effort of some fifty specialists; and yet one lone reviewer is to pass "critical judgment" upon the appropriateness of the matter included, the adequacy of the treatment, and the completeness of the work. Evidently this is a hopeless task. The lone reviewer may, however, without seeming presumptuous, be permitted to point out some of the features of the book that seem to him admirable and others which seem superfluous or overdone.

In harmony with other handbooks published by the McGraw-Hill Book Company, the subject matter is divided into sections, the headings of which are as follows: Mathematical Tables and Weights and Measures; Mathematics; Mechanics of Solids and Liquids; Heat; Strength of Materials; Materials of Engineering; Machine Elements; Power Generation; Hoisting and Conveying; Transportation; Building Construction and Equipment; Machine Shop Practice; Pumps and Compressors; Electrical Engineering and Engineering Measurements, Mechanical Refrigeration, etc. The material for each of these sections has been contributed by a specialist or specialists; in one case as many as thirteen are listed. Many of the sections are introduced by a selected list of references, but this practice is not uniform, nor are the lists complete.

The sections on mathematics and mechanics are very complete and detailed. In fact it is very doubtful if it is necessary to include in a book of this nature the more elementary principles of mathematics. A person who is not already versed in the simple operations of algebra will not purchase a handbook for a text, and it certainly is not advisable to make the book cumbersome for others by the addition of nonessentials. There is a marked difference between a handbook and a textbook. It is difficult to pick out for special mention any of the sections. The sections on Friction, Hydraulics, Materials of Engineering, are authoritative and complete. The section on heat contains a more complete summary of this subject than any other handbook in the English language with which the writer is familiar and it is all condensed within 85 pages. The section on Power Generation will especially appeal to power engineers. In this section are discussed in a comprehensive manner all types of prime movers, together with a vast amount of matter of value to power engineers and central-station employees. The section closes with an interesting and valuable discussion by Professor Marks on "The Cost of Power."

As the needs of electrical engineers are well supplied by two large handbooks, one could hardly expect an extended summary of electrical-engineering principles and practice in a mechanical engineer's handbook. No one, perhaps, better appreciates the difficulty of condensing within 100 pages the vast amount of electrical-engineering data than the authors who compiled Section 14. That acute discernment was exercised in selecting the material is made evident by careful examination of the contents. The article on "Cost of Electrical Apparatus" will be found of great value in estimating the cost of electrical machinery.

While the foregoing is a very imperfect summary of the contents of the book, it may give some idea of its scope but can hardly indicate its character. In so far as comprehensiveness, freshness of material, and availability of contents is concerned, it is a most excellent mechanical engineers' handbook. It should find a place on the desk of everyone who may have need of engineering data.

C. M. JANSKY.

"The Year Book of Wireless Telegraphy and Telephony, 1916." London: The Wireless Press, Limited. Cloth, 876 pages (5¼x8¼ inches), illustrated. Supplied by Electrical Review Publishing Company, Inc. for $1.50.

Another enlargement in size marks the fourth annual appearance of this valuable work of reference. The bulk of the volume is made up of the lists of land and ship stations, call letters and laws and regulations of various countries, the latter being quite complete and provided with a separate index. As usual, there are a number of special articles, among which may be mentioned "Intelligence in Naval Warfare," by Archibald Hurd; "Photoelectric Phenomena," by J. A. Fleming; "Capacitance, Inductance and Wave-length of Antennas," by W. H. Eccles; "Wireless Waves in the World's War," by H. J. B. Ward; "Measurement of Signal Intensity," by John L. Hogan, Jr.; "The Problems of Interference," by Percy W. Harris. Among other matters included are international time and weather signals, a glossary of terms, useful formulas and data, a list of English and American wireless patents issued in 1915, bibliography, and a directory of wireless societies. Altogether, the year-book will, as usual, be indispensable to anyone needing information along wireless lines.

"How To Make Low-Pressure Transformers." By F. E. Austin. Third edition. Hanover, N. H.: Published by the author. Boards, 22 pages (4¾x7¼ inches), illustrated. Supplied by Electrical Review Publishing Company, Inc. for 40 cents.

The first edition of this booklet, published over a year ago, has proved so popular that a second and a third edition have appeared this year. The later editions have had some additional matter added and are still better adapted to their purpose than the first edition. New ways of making cores are the principal additions to the third edition. With this book as a guide, no one should have any difficulty in building a small transformer, at small cost, without the facilities of a well equipped shop.

"Homans Automobile Handbook." By J. E. Homans. New York: Sully and Kleinteich. Cloth, 248 pages (4¾x7½ inches), 80 illustrations. Supplied by Electrical Review Publishing Company, Inc. for $1.00.

For any one not familiar with the operation of the gasoline automobile this volume will be very useful, as it gives a detailed and yet not too technical description of the various parts of the driving mechanism and an explanation of their action and use. The volume deals entirely with this type of automobile, steam-propelled cars and electric vehicles not being included. There are in all 20 chapters, five of which are devoted to the transmission apparatus, eight to the engine, two to the carburetor, two to ignition, one to lubrication and one to the causes and symptoms of engine trouble. The latter especially should prove helpful to the inexperienced operator in locating and correcting the trouble which sooner or later interrupts the operation of any motor which does not have expert attention. Among the types of transmission the Owen-Entz magnetic transmission comes in for consideration and this, as well as the purely mechanical transmissions and speed changers, is described and explained. The book is well written, well printed and supplied with numerous diagrams for illustrating the various mechanisms involved. The principal omission which we note is in reference to electric starting and lighting apparatus, which has become so common a part of the modern gasoline car that a volume of this type seems incomplete without it.

NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

New Line of Porcelain Sockets.

The use of porcelain sockets is becoming very general for all circuits requiring fittings capable of resisting the ravages of weather, chemical action and other deleterious effects. This growing use has naturally created a demand for new types of porcelain sockets to meet a considerable number of special requirements. In this connection the firm of Harvey Hubbell, Incorporated, Bridgeport, Conn., has placed on the market a line of pull, key and keyless porcelain sockets provided with aluminum caps, the bushings of which are tapped with a one-half-inch thread inside and a three-fourths-inch thread outside. The sockets are designed primarily for use as a part of outdoor fixtures although very suitable for other places where sockets of this type are desired.

New Porcelain Socket.

The fixture canopy may be dropped over the socket cap, thus leaving the threaded bushing protruding and on this bushing a locknut may be threaded to hold the canopy rigidly in place. The unit can then be screwed to either a hollow gooseneck or bracket through which the wires pass. Many other uses for this new line of sockets will readily be apparent.

Electrically Operated, Animated Window-Display and Advertising Machine.

A very unique and attractive advertising device has recently been perfected by the Mott-Le-Gaige Animated Advertising Corporation, 226 West Forty-second Street, New York City. The device embodies ingenious achievements of electrical and photographic inventive skill and produces an animated advertising display that is bound to attract much favorable attention.

The "Animated," as it has already come to be known, made its first public appearance at the Exposition of the Printing and Allied Trades at Madison Square Garden, New York City, September 30 last, and following this event, in co-operation with the United Electric Light & Power Company of New York, was one of the most novel and attractive features at the annual New York Electrical Exposition and Motor Show, at Grand Central Palace. On October 23, the United company installed the "Animated" as a permanent exhibit and demonstration of its various electrical appliances and modern lighting effects in its magnificent show windows at the corner of 146th Street and Broadway, where it has attracted crowds continuously from morning until night.

Front View of Animated Window Display.

In principle the new device is an automatic stereopticon in which a number of slides are successively displayed for 15 seconds each, but the slides instead of remaining stationary for that interval are given a moving or animated aspect. The slides consist of two glass plates inserted in a metal holder so as to be practically secure from breakage. On one plate a composite photograph of the picture is taken from actual life or from still photographs, in each case showing three different, but related positions, all superimposed one over the other on the composite photographic plate. The other plate consists of a screen which is continually moved back and forth in short steps before the composite picture, thus for brief instants showing the individual poses and giving the animated effect of a moving picture.

Mechanism for Animated Display.

The machine has a magazine holding 30 slides, which revolves so as to display them one after the other automatically, completing a cycle in 7.5 minutes. The operation is entirely electrical, requiring only a single incandescent lamp for furnishing the illumination of the slides and a small motor to move the slides periodically and to move the screen plate continually. It takes but little current to operate the entire device, which can be connected to any socket.

The projection, 10 by 12 inches, or larger if desired, is made through a shadow box. This is set in place and the surrounding space in the window is devoted to tasteful decoration with the article or articles being advertised. The subjects reproduced on the glass plates or transparencies are preferably photographed from life and in many instances are posed by beautiful show girls. The animation and natural and beautiful coloring of the pictures are irresistibly attractive to the eye. Hundreds of these slides exploiting as many different products are kept in stock and are at the disposal of the advertiser, or he can furnish his own subjects and slides will be made to order.

As a medium of legitimate advertising and intimate publicity the device is very forceful and convincing, because it appeals and holds the attention of the prospective buyer and stamps indelibly in his mind, not only the artistic, but the commercial story of the product.

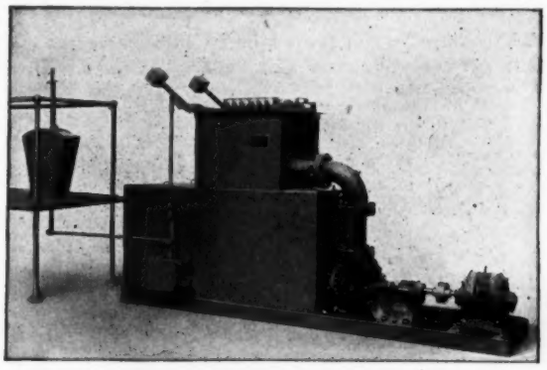
Liquid Rheostatic Control for Large Wound-Rotor Induction Motors.

The extensive use of electric motor drive for mine haulages, hoists, dredges and similar applications, has brought about the necessity for a controller for large wound-rotor induction motors which would give wide and accurate speed variation, positive time-limit acceleration, and allow the motor to run at reduced speeds for long periods. To meet these conditions the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has designed the liquid type of control which is shown in the accompanying illustrations. These controllers have been in successful operation in various applications for the last four years and have proven equal to the most severe requirements.

A liquid controller consists essentially of a primary panel and a liquid rheostat. The primary panel is made up of mechanically interlocked magnetic contactors for starting, stopping, and reversing the motor, oil circuit-breakers which entirely disconnect the motor from the line in event of an overload, a fused knife switch for the pump motor, and a low-voltage relay for the protection of the operator and apparatus against voltage failure. The secondary control consists of a liquid rheostat complete with brass or wrought-iron cooling coils for varying the resistance in the motor secondary, a pump and pump-motor switch for the circulation of the electrolyte, and a master switch for the control of the equipment. For plugging service a single lever H-slot device and two overload relays are used. The two overload relays are mounted on the primary panel and protect the motor from overloads when running, but are short-circuited when plugging the motor. When operating under these conditions, the circuit-breaker is set to protect the motor against exceptional overloads and short-circuits on the motor, but too high to trip out in ordinary plugging service.

In the type of control shown, the depth of the liquid, in which the electrodes are immersed is varied. This principle insures smooth acceleration and close speed regulation of the motor, as an infinite number of steps can be obtained by gradually varying the depth of the liquid. It eliminates objectionable jerks and sudden strains in both the cable and equipment when starting loads of large inertia. The construction and operation of the control is so simple that even an inexperienced operator can obtain good results. Maintenance costs are low, since the electrodes are practically the only parts requiring renewal and this very infrequently. It is of especial value for heavy-duty reversing service, where starting is frequent and the motor is run at reduced speeds. It is furnished for any primary voltage and frequency and for two or three-phase.

As shown by the diagram, the three secondary phases of the motor are each connected to a set of electrodes suspended in the electrode tank. The operating lever is attached to an arm just above the master switch. When the lever is in the "off" position, the electrolyte, which is a solution of sodium carbonate (sal soda) is at its low-



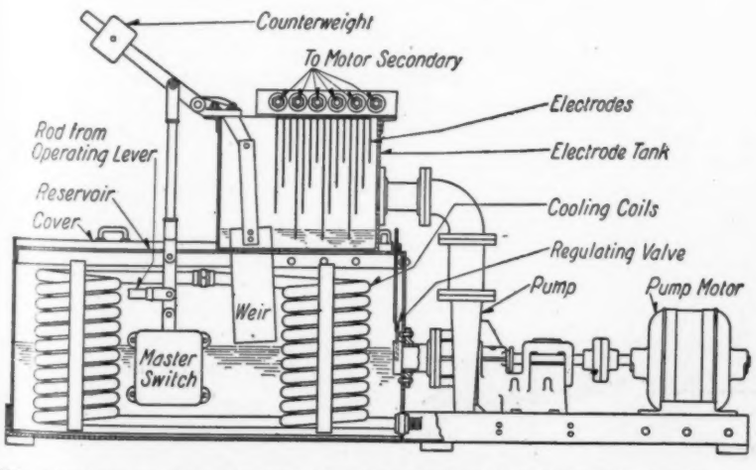
General View of Liquid Rheostatic-Control Outfit.

est level. When the operating lever is moved from the "off" position, the contactors in the primary circuit are operated by the master switch and the weir raised. The electrolyte, which is circulated continuously by the pump, rises as the weir is raised. This immerses the electrodes more, decreases the resistance in the rotor circuit and speeds up the motor. By adjusting the position of the weir, the resistance in the rotor circuit is changed and the speed of the motor is regulated.

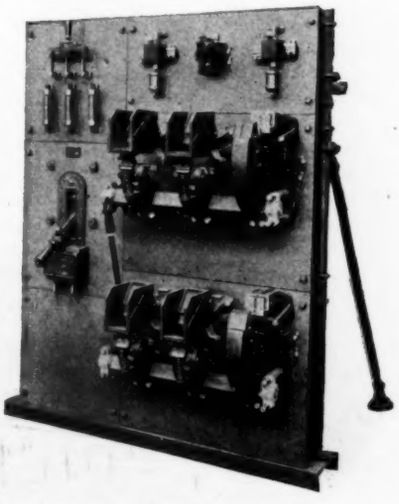
A regulating valve in the pump discharge or intake pipe prevents the liquid from rising in the electrode tank at a rate greater than that for which the valve is adjusted. So the lever may be moved directly to the "full on" position while the liquid will rise at the rate determined by the valve setting. The weir, however, is of such a size and design that the electrolyte will flow through to the lower compartment speedily enough to take care of plugging when that is practiced.

For plugging service the single-lever H-slot device and the two overload relays afford a positive protection against wrong operation of the lever.

To prevent overtravel in hoist work, either single or double-pole hatchway limit switches can be furnished. When the hoists are used for lowering, an overspeed device is desirable. Cam limit switches form another means of protection, safeguarding against accidents due to care-



Side Elevation and Partial Section Showing Details of Liquid Rheostat Outfit.

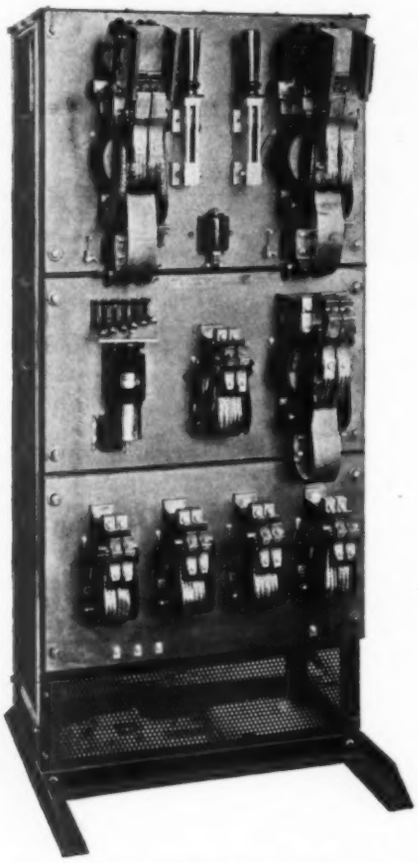


Primary Control Panel.

lessness on the part of the operator. These consists of a number of switches operated by means of cams mounted on a hexagonal shaft connected to the motor or driven mechanism through chain and sprocket or worm gear.

Automatic Controller for Large Direct-Current Motors.

The controller illustrated herewith is a recent development of the Industrial Controller Company, Milwaukee,



Automatic Controller for Large Direct-Current Motors.

Wis., and is intended for use in connection with large direct-current motors.

This controller is quite novel in its operation as it combines both current-limit and time-limit acceleration, thereby not only securing protection to the motor by means of the current-limit acceleration, but prevents too rapid acceleration of the motor under light loads.

The controller consists of a number of large magnetic contactors, the first of which is equipped with a powerful blowout coil and arcing shields, and the acceleration is accomplished by means of a master solenoid at the left of the panel, which when closing energizes the coil of the large magnetic contactors successively, thereby closing the switches and bringing the motor up to speed.

The acceleration of the master solenoid is retarded by means of an air dashpot, and in addition by a braking magnet, which in turn is controlled by a current-limit relay at the center of the panel. When the current in the motor exceeds a predetermined amount, the master solenoid is prevented from operating until the current is reduced to the proper amount for which it is set.

On the controller illustrated, magnetic switches with blowouts are provided for both slides of the line and each is equipped with an overhead relay, thus giving overload protection to the motor. These controllers are particularly adapted for use with large rolls and similar machinery.

A New Disappearing Footlight Furnished in Complete Finished Sections.

The accompanying illustrations show a new design of disappearing footlight, which is especially suited for stages and platforms of high schools, auditoriums, halls, churches, theaters, also show rooms, show windows or wherever a footlight is required that must be out of the way when not in use.

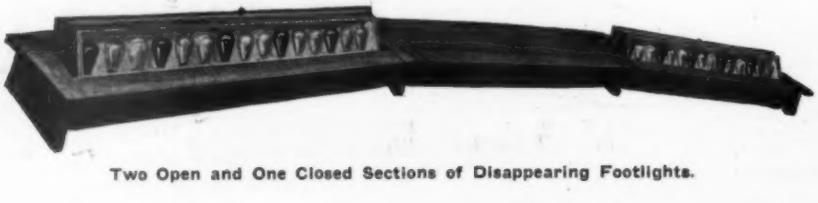
These footlights are made up and furnished in complete finished sections, 3 to 5 feet in length which can be mitered to fit any curvature of the stage, or in longer sections for straight footlights. They can also be provided for a single or double row of lamps with two or more color combinations.

The structural simplicity of these footlight units is especially noticeable as compared to older designs of disappearing footlights with elaborate raising and lowering mechanisms. Each section as furnished consists of a top frame and door made of one-inch hard wood to match the flooring, so that for installing all that is required is to provide a space in the floor of sufficient depth and width to receive the unit, and the top of the footlights is inserted flush and floored in to form a part of the stage floor.

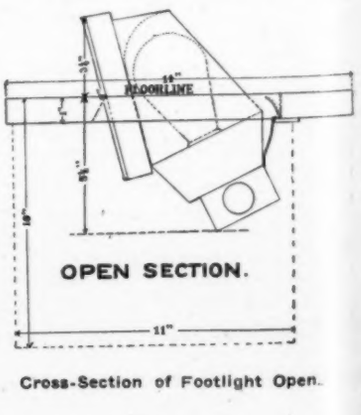
The footlights are mounted on the lower side of the door and, agreeable to the underwriters' rules, are set in a galvanized-iron reflector trough. Connections are made through an iron splicing box, which can be placed either in the center of the section or at the end, as is necessary for clearance between studs or beams. The door or cover of the footlights is hinged on a special heavy iron bracket hinge supported on the top frame, and each cover is provided with a flush ring and lock at the center.

To raise the footlights, the doors are simply swung open by means of the pull rings. A small spring catch shown in the line drawing in the open section, holds them in the raised position, and when raised, the footlights extend 3.5 inches above the floor level. When closed, the doors turn down flush with the floor and rest against heavy iron supports, such that the covers are as strong as any part of the floor, and will not sag or break through when dancing or moving heavy objects over them.

This disappearing footlight is designed and manufactured by the Universal Electric Stage Lighting Company, Kliegl Brothers, proprietors, 240 West 50th St., New York City.



Two Open and One Closed Sections of Disappearing Footlights.



Cross-Section of Footlight Open.

Improved Service or Motor Switch of the Inclosed Type.

The strong agitation of the "safety-first" principle has led to the rapid increase in the use of inclosed switches, both in connection with motor installations in industrial plants and for connecting and disconnecting the service to any building. An improved form of such a switch has been patented recently and possesses a number of distinctive features. It can be made in a great variety of forms, single, double or triple-pole, etc.

Fig. 1 herewith shows a simple triple-pole form. At the right side of this illustration is a section through the device in which it is seen that the iron box *5* entirely incloses the outfit and is arranged so that a door can be fitted in front. Across the box are two horizontal strips made of slate or other insulating material. Both of these (*6* and *7*) are for the purpose of supporting the connecting lugs for the incoming and outgoing wires and also the clips *8* and *9* for the different blades of the switch. These clips, as shown in the side view, have an L-shape and are arranged so that the tension thereon may be adjusted by means of bolts so as to take up wear. The switch blades *15* are mounted in slots or notches on a horizontal rotating axle midway between the knife-blade clips. The switch blades are mounted on this rotating member parallel to its axis and have their contact portions twisted at right

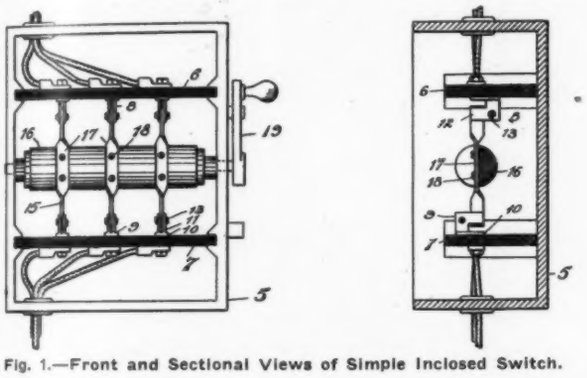


Fig. 1.—Front and Sectional Views of Simple Inclosed Switch.

angles thereto so as to come in perfect alinement with the contact clips. This construction is said to make the blades very strong and keep them properly alined at all times. The switch group is turned as a single unit by means of the handle *19* shown outside of the box. It will be seen that this construction provides a double break in each circuit wire.

A somewhat more elaborate form of this switch is shown in Fig. 2. In this illustration a portion of the inclosing case is broken away in the side view shown at the right so as to disclose the internal construction along the line *2-2* in the main portion of the illustration. It will be observed that the general arrangement of the switch blades and operating members for the contact clips is similar to that already described. The switch shown in Fig. 2 includes a separate fuse compartment below the switch compartment proper. The front covers of each or both of these compartments may be hinged so as to give access thereto.

An important feature of the switch shown in Fig. 2 is that it is arranged to lock in either the open or closed position automatically. This is done by means of a spring within the hub of the handle. The outer part of this hub is in two portions joined by a corrugated surface. If the switch is to be arranged so as to be biased to the open position, the spring and the weight of the handle combine to rotate the member *26* which carries the various switch blades. At the side of the box is a segment *38* which has in it two notches that can be engaged by a bolt inside of the handle. This is normally pressed outward by means of a spring in the handle. If the switch is to be released from the closed position, the knob *44* at the end of the handle needs merely to be pressed in, which releases the bolt in the handle from the notch in the segment so that the combined weight of the handle and the action of the spring in its hub throws the switch open automatically, thus providing the maximum of protection in a device of this kind. This spring

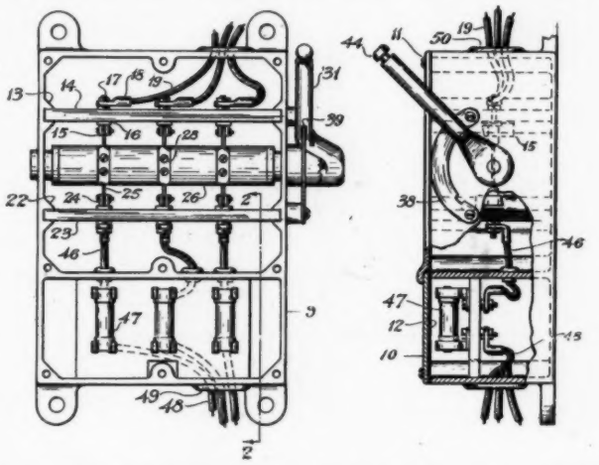


Fig. 2.—Front and Side Views of Spring and Gravity-Actuated Locking Service or Motor Switch.

and gravity action also eliminates the liability for serious arcing at the switch contacts.

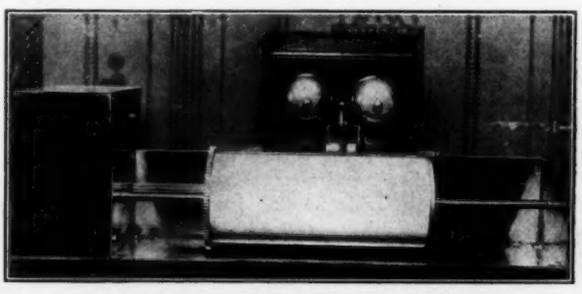
The patents covering these switch developments are owned by B. J. Bernhard, 2432 North Francisco Avenue, Chicago, Ill.

Calling-Number Recorder for Magneto Telephones.

A device has been invented by Charles E. Bedeaux, of Grand Rapids, Mich., which records any number called over a telephone. It is bolted to the battery box and may be used by the subscriber who expects to be absent from an office or residence and wishes to know who has called him during his absence. It consists of a steel platform on which a clockworks and a cylinder covered with celluloid are mounted. With the release of a clutch the mechanism through a system of cogs revolves the cylinder. On the cylinder rests a pencil which is connected through a bridge to a pinion that in turn communicates through a wire to the clapper of the bell. With every vibration the pencil registers a mark which may easily be interpreted according to the following code:

1—1 short ring; 2—1 long; 3—1 short, 1 long; 4—1 long, 1 short; 5—2 short; 6—2 long; 7—2 long, 1 short; 8—1 long, 2 short; 9—1 short, 2 long; 0—2 long, 1 short.

If *A* calls *B* and *B* is not at home, *A* immediately calls his number back. If his number is 32,590, he rings 1 short, 1 long; 1 long; 2 short; 1 short, 2 long; 2 long, 1 short. The marks are found by *B* on his return and he immediately calls *A*. The invention is expected to be of great value to physicians and business men and it will be a promoter of efficiency. The manufacture price will not exceed $2. The patents call for the addition of a tape which will record the time of the call.



Calling-Number Recorder for Telephones.

INDUSTRY ACTIVITIES

Stow Manufacturing Company, Binghamton, N. Y., has issued a booklet on its line of portable electric tools.

A. F. Daum, Pittsburgh, Pa., has issued Bulletin H-18 giving list prices on Daum refillable cartridge and plug fuses.

Federal Sign System (Electric), Lake and Desplaines Streets, Chiciago, Ill., is sending out a mailing folder descriptive of electric signs.

H. Boker & Company, Incorporated, 101 Duane Street, New York City, has issued price list No. E3, covering some of the standard fractional horsepower motors made by Ercole Marelli & Company, Milan, Italy, and which are distributed in the United States by the former company.

Wagner Electric Manufacturing Company, St. Louis, Mo., has issued Bulletin 113, a synopsis which serves as an index of the subject matter of the company's different bulletins and catalogs, and which describes briefly the various types of its apparatus that have been developed and are manufactured.

Moloney Electric Company, St. Louis, Mo., has issued catalog No. 160, a 32-page booklet which give illustrations of a number of transformer installations made by the company. The photographs show the variety of service in which these transformers have been placed. Copies of the booklet will be sent those interested upon request to the company.

Cutler-Hammer Employees Give Hallowe'en Entertainment.—More than 50 employes of the Cutler-Hammer Manufacturing Company took part in the seventh annual hallowe'en entertainment given by the company in Plankinton Hall of the Milwaukee Auditorium October 21. Because of the large sale of tickets it was necessary to give two performances. The C-H Activities Committee was in charge of the entertainment.

National Lamp Works of General Electric Company, Cleveland, O., has announced the personnel of the board of judges selected to award the 60 prizes, ranging from a Ford car to $5, to be given in its window display contest which opened October 1 and will close December 15. The board is composed of A. A. Gray, general manager of ELECTRICAL REVIEW AND WESTERN ELECTRICIAN; F. M. Feiker, editor of *Electrical World* and *Electrical Merchandising,* and N. H. Boynton, manager of the National Lamp Works publicity department.

Addition to Trumbull Mazda Lamp Plant.—The contract for a $75,000 addition to the plant of the Trumbull Mazda Lamp Company, at Warren, O., has been awarded and work will be commenced at once. Part of the present building will be torn down, according to the plans of the General Electric Company's engineers, who are in charge of the work. The addition will be of three floors, 44 by 60 feet, and will contain, besides working quarters, a private reading room, a dispensary and a cafeteria for the use of employees. A modern heating and ventilating system will also be a feature.

Monitor Controller Company, Baltimore, Md., originators of the "Just Press a Button" system of automatic control for all classes of motor-driven machinery, has moved into larger quarters at 500-16 East Lombard Street, Baltimore, about twice the size of those formerly occupied. The quarters will enable the Monitor company to cope with the rapidly growing demand for its direct and alternating-current controllers, and at the same time provide facilities for the continued development of full automatic control for metal working machinery such as lathes, drills, planers, etc. The pioneer experience of the Monitor company in this line places it in an unusual position for consultation on such special motor-control problems.

Packard Electric Company, Warren, O., furnished the feature, a large American flag, in a recent preparedness parade held in Warren and participated in by the people of several counties. The flag, said to be the largest in the world, is 53 feet wide and 120 feet long and required from 75 to 100 persons to carry it, these being assisted by numerous juvenile Americans who patriotically marched underneath the flag to prevent it from touching the ground. The publicity arrangements of the parade were in charge of the advertising department of the Packard Electric Company, which donated the services of the department to the parade committee. As a means of stimulating interest in wireless telegraphy as a defense measure, the company donated a wireless transformer, which was given to the captor of one of several hundred balloons liberated along the line of march. It had been previously announced that one of these balloons would have attached to it a card entitling the holder to claim the transformer which had been part of a preparedness window display for several days prior to the parade.

View of Large American Flag, Furnished by Packard Electric Company, a Feature of Preparedness Parade Held in Warren, O.

Western Electric Company has issued a new publication, *The Farmer's Electrical Handbook,* a 160-page book containing useful electrical information and practical working directions for installation and maintenance of electrical equipment on farms. In conjunction with the issuance of this handbook, the company is sending to electrical dealers, contractors and central stations a mailing folder descriptive of the book and its plan of building up business with the farmer on electrical goods. The salient features of the plan is that in no way does it resemble a mail order proposition. An extensive advertising campaign is being carried on in the leading farm papers, in which the offer of the handbook free to farmers is made. When an inquiry is received, in addition to mailing out a copy of the handbook, a post card is also sent, referring the farmer to a dealer in his locality who handles Western Electric products. Also a post card is sent to the dealer referred to, advising him that the farmer has received the handbook, and attached is a card for the dealer to send to the farmer asking him to call at the store when in town. The company's plan is a constructive effort to build up a business with the farmer on electrical goods, and limit the distribution of this material to the established channels of the electrical industry.

New Catalog of Central Electric Company

THE Central Electric Company, Chicago, has issued an annual catalog for a good many consecutive years, but never in the history of the company has there been so great an interest manifested in this feature of the company's activities as is true of catalog No. 39 for 1917, which is now being distributed.

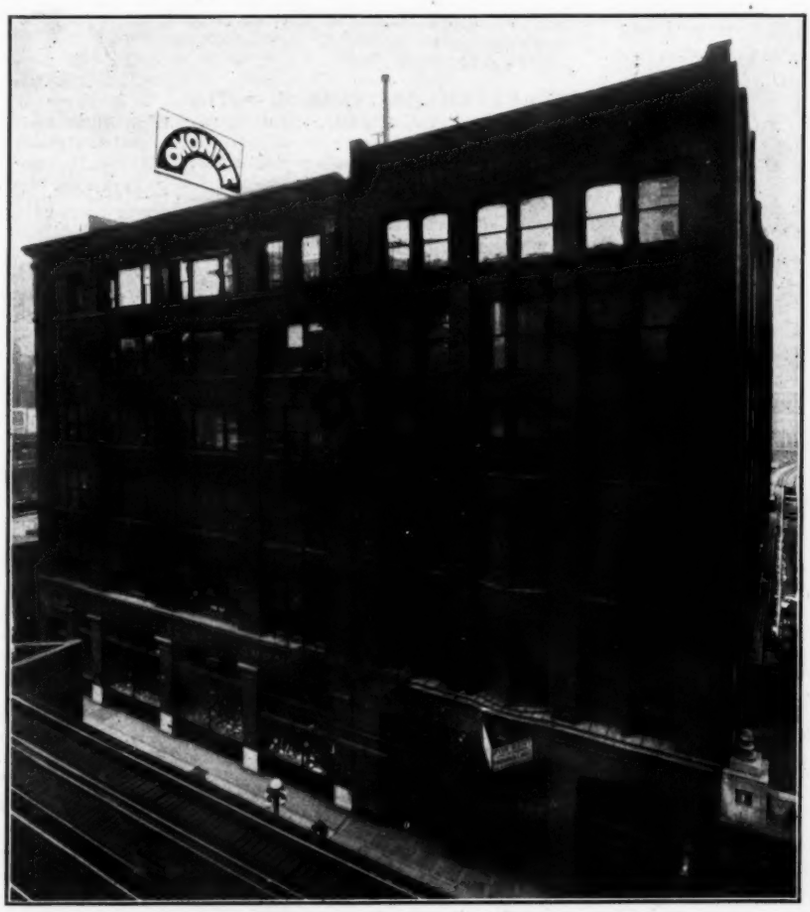
Of first importance is the fact that the new catalog contains 1,408 pages embodying over 25 per cent more information than any preceding issue, and it weighs but 4.5 pounds, two pounds less than catalog No. 28 of last year. To accomplish this desirable result it has been necessary to adopt every refinement known to the printing and publishing art. In the words of George A. McKinlock, president of the company, "the new catalog is in line with the company's policy, which stands for progressiveness in the fullest sense of the word. Because of the lighter weight of catalog No. 39 we save considerably in postage expense and this saving is of course applied to increasing our facilities for rendering service to our customers."

George A. McKinlock, President of the Central Electric Company.

The catalog is individual in appearance, having the standard blue cover with light yellow ink and yellow paper. One of the features claimed for it is that it can be recognized on the shelf as far as the eye can see.

Interspersed through it are four color process plates illustrating such specialties as Okonite, Maxolite, Ralcos, etc., which will undoubtedly attract a great deal of attention to them and add to the general attractiveness of the publication.

For isolated plants and contractors where there is no rigid inspection, there have been included in the catalog all of the Underwriters' rules for wiring. This feature together with the usual engineering data included should make the catalog a book of general reference. It will undoubtedly be used by contractors in small towns to assist them in interesting their customers in a better class of work which, of course, means more and better material and more money on the job. Standard list prices of manufacturers are used throughout and the standard schedule of discounts may be applied to all the merchandise.



Building Just Purchased by Central Electric Company and Its Present Quarters.

It is a fact worthy of note that this catalog makes its appearance at a time when the growth of the company is exemplified by the purchase of a new building which will add 80 per cent to the space now occupied by the company. As mentioned in our issue of October 28, the new building is north of and immediately adjacent to the company's present building at 320 South Fifth Avenue. It is a substantial, attractive structure comprising six floors and basement having a frontage of 50 feet and a depth of 153 feet. The building at present occupied by the company is also a six-story structure 87 feet wide by 153 feet deep. It was built in 1906 after the original building was destroyed by fire.

Plans are now being prepared for the remodeling of the building to meet the requirements of the company and as soon as these are completed the actual work of remodeling will be undertaken. Charles Frost, well known as the architect of the famous Chicago terminal station of the Chicago & North Western Railroad has been engaged to prepare the plans.

Aside from the many innovations which it is intended to incorporate in the arrangement of the new building from the standpoint of the electrical supply business, it is the present plan to give considerable thought to the comfort and welfare of employees. This feature will be kept in mind in the design of the lighting system, in the provision for numerous rest rooms, etc.

The need for this additional space has been felt for some time to take care of the rapidly growing business of the Central Electric Company. Established in 1887 with such well known lines as Okonite wire, Columbia incandescent lamps, D. & W. fuses, etc., the company's growth has been remarkable. Recently the company has become the Chicago distributor for General Electric wiring devices and will carry a large warehouse stock. This and other new lines recently acquired have made necessary the provision of addiitonal facilities.

LATEST APPROVED FITTINGS

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association

COMBINATION SERVICE ENTRANCE BOX.—Electrical Development Company, 821 Union Avenue, New Orleans, La.

This device consists of a combination of a cutout, push-button switch and meter box, provided with two receptacles for attachment plugs, and a lamp receptacle. 10 amperes, 250 volts.

Listed July 29, 1916.

COOKING APPLIANCES.—The Standard Electric Stove Company, 1720 North Twelfth Street, Toledo, O.

Ranges made up of combinations of oven, fireless cookers and hot plates. 2,700 watts, 110 volts, catalog No. 300; 3,400 watts, 110 volts, catalog No. 400; 4,300 watts, 110 volts, catalog No. 501; 5,000 watts, 110 volts, catalog No. 601.

Listed September 18, 1916.

METAL MOULDING FITTINGS.—The W. A. Bonnell Company, 132 Church Street, New York, N. Y.

Fittings for use with "National" metal moulding. Boxes for drop lights

Standard Receptacle.—Luminous Unit Company.

and fixtures, catalog Nos. 2305, 2310. Switch or receptacle support, catalog No. 2360.

Listed September 2, 1916.

OFFICE APPLIANCES. Shaving Machine for Dictating-Machine Cylinders.—Thomas A. Edison, Incorporated, Orange, N. J.

A steel case on legs incloses a special motor which drives a mechanism for shaving wax cylinders. Motors for 125 or 250 volts, direct or alternating current. Power consumption 40 watts.

Listed September 19, 1916.

RECEPTACLES, for Attachment Plugs.—Benjamin Electric Manufacturing Company, 120 South Sangamon Street, Chicago, Ill.

Center contacts and screw shells automatically disconnected from circuit when lamp holder is empty. Made in round form with or without round or rectangular faceplate, and rectangular form with or without single or gang faceplates with or without lids on plates. "Benjamin," 660 watts, 250 volts, catalog No. 7659.

Listed September 1, 1916.

RECEPTACLES, Standard. — Appleton Electric Company, 212 North Jefferson Street, Chicago, Ill.

Keyless, 660 watts, 250 volts. Conduit box, catalog Nos. 7640, 7736.

Listed September 7, 1916.

RECEPTACLES, Standard.—Best Electric Company, Pittsburgh, Pa.

"Best" composition shell. Keyless, 660 watts, 250 volts, sign type, catalog No. 2550.

Listed August 23, 1916.

RECEPTACLES, Standard. — The Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins" metal shell, closed or slotted bases.

Key, 250 watts, 250 volts, catalog Nos. BY-10, BY-11.

Key, 660 watts, 250 volts, catalog No. BY-12.

Pull, 250 watts, 250 volts, catalog No. BY-15.

Twin pull, 660 watts and 250 watts, 250 volts, catalog No. BY-17.

Turn, 250 watts, 250 volts, catalog No. BY-14.

Also all of above types with shadeholders attached; key types with composition or insulated metal key.

Listed September 1, 1916.

RECEPTACLES, Standard. — The Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins" metal shell, closed or slotted bases.

Keyless, 660 watts, 250 volts, catalog No. BY-13.

Conduit box covers, catalog Nos. 4031 and 4032.

Listed September 2, 1916.

RECEPTACLES, Standard. — The Luminous Unit Company, 2615 Washington Avenue, St. Louis, Mo.

Keyless, porcelain shell, "L. U. Co." Fixture, 660 watts, 250 volts, catalog No. 101.

Listed September 19, 1916.

RECEPTACLES, Standard.—Trenton Electric & Conduit Company, Trenton, N. J.

T. E. & C. Co., porcelain shell. Keyless, 660 watts, 250 volts; cleat, catalog No. 175.

Listed September 2, 1916.

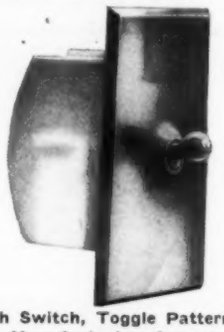
ROSETTES, Fuseless.—The Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins," 3 amperes, 250 volts; cleat, catalog No. BY-26.

Listed September 2, 1916.

SWITCHES, Push Flush.—Newton Manufacturing Company, 119 Earle Avenue, Lynbrook, N. Y.

Toggle pattern, types A and B; single-pole, catalog Nos. 701, 751;



Push Flush Switch, Toggle Pattern.—Newton Manufacturing Company.

double-pole, catalog Nos. 702, 752; three-way, catalog Nos. 703, 753.

Listed August 25, 1916.

SWITCHES, Automatic. — Baruch Electric Controller Corporation, San Francisco, Cal.

A multiple-pole air-break switch of knife-blade type, designed to be opened under spring tension when released manually or by operation of a solenoid coil mechanism controlled by a thermal time element relay. For alternating or direct-current motors, 600 volts or less.

Listed August 9, 1916.

SURFACE SWITCHES.—The Standard Electric Manufacturing Company, 216 North Clinton Street, Chicago, Ill.

Single-pole, catalog Nos. 3050, 4050; double-pole, catalog Nos. 3030-31, 4030-31.

Listed August 24, 1916.

TRANSFORMERS. — Menominee Electric Manufacturing Company, Menominee, Mich.

Bell-ringing transformer, high voltage 110 volts, low voltage 8 volts.

Listed August 14, 1916.

WIRE, RUBBER-COVERED—Atlantic Insulated Wire & Cable Company, 120 Liberty Street, New York, N. Y.

Marking: Green and black threads in braid, or green and black threads parallel to wire under braid, or two ridges on insulation 90 degrees apart.

Listed September 8, 1916.

PERSONAL AND BIOGRAPHICAL

MR. WALTER C. ALLEN, electrical engineer of the District of Columbia, has been appointed executive officer of the District of Columbia Public Utilities Commission.

MR. G. D. JONES, who has been state electrical engineer for California during the past six years, has tendered his resignation with the intention of going into business for himself.

MR. GEORGE ALEXANDER, formerly chief engineer of the Atlantic Shore Railway's generating station at Kittery Point, Me., has been appointed chief engineer of the Worcester Electric Light Company, Worcester, Mass.

MR. L. G. SHEPARD, formerly with the Federal Sign System (Electric), in Chicago, has left that company to take the position of controller with the Milwaukee-Western Fuel Company, with offices at 14 Grand Avenue, Milwaukee, Wis.

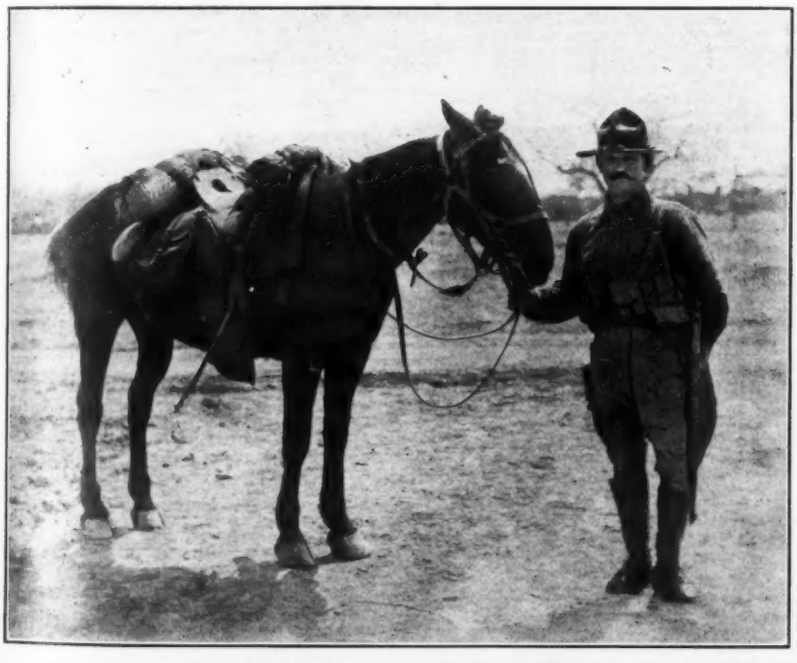
MR. F. T. ANDRAE, secretary of Julius Andrae & Sons Company, Milwaukee, Wis., has been elected president of the Milwaukee Electric League and Jovian Order, and succeeds MR. H. J. MEYER, who has removed to Minneapolis, Minn.

MR. FRANCIS P. THRASHER has been appointed superintendent of the Buzzards Bay Electric Company's plant at Chatham, Mass., his territory to include all the district east of South Yarmouth. He has been in the company's employ several years.

MR. EDWARD HAMMETT, formerly vice-president and general manager of the Sheboygan (Wis.) Electric Company, has resigned and with MR. AUGUST WESTERMEYER, auditor of the Sheboygan company for 14 years, has become connected with the Northern Furniture Company, of Sheboygan.

MR. CHARLES B. KELSEY has retired from Kelsey, Brewer & Company, which firm will be dissolved but will be continued under the old name. Mr. Kelsey will retain his interest in the American Public Utilities Company and will continue as chairman of the board of directors. In retiring from the partnership which he founded, Mr. Kelsey is carrying out a plan to take a long vacation that he has long had under consideration. It is understood that he will spend the winter abroad.

MR. CARL METZ, for a number of years connected with the Central Union Telephone Company, has been made general wire chief for Companhie Telephonica Estado De Sao Paulo, Brazil, and has sailed for Rio Janeiro to enter upon his duties. As district wire chief at Columbus, Mr. Metz established such a reputation for efficiency that his name was given to C. M. Mauseau, general manager of the Brazilian company, who was in this country looking for an expert of this kind. Mr. Metz began with the Central Union as a lineman. He is a prominent Jovian, being the present Statesman for Ohio.



L. S. Montgomery "Somewhere in Texas."

The trials and tribulations of an executive of a prominent electrical manufacturing concern—even in these busy times—pale into insignificance compared to soldiering for Uncle Sam in Texas. In witness whereof we have the testimony of L. S. Montgomery, Troop I, First Cavalry, New York Division, who in civil life is manager of the Buffalo office of the National Metal Molding Company. Private Montgomery answered the call to arms on June 26 and has been enjoying the Texas climate continuously since that date. Reveille call is at 5:15 a. m. and there is a strenuous program of work until 6 p. m. every day without variation. "You can see," he writes, "that the life of a trooper is no sinecure."

MR. STUART WILDER, the newly elected president of the Empire State Gas and Electric Association, was born in Rockwood, Tenn., in 1872. After graduating from Swarthmore College, he

Stuart Wilder.

was identified with lumber and railroad interests in Tennessee for some time, and then became connected with the Stanley Electrical & Manufacturing Company, of Pittsburgh, Pa. Later he joined the staff of Sanderson & Porter, engineers and contractors, New York City, leaving to become assistant engineer of the Westchester Lighting Company, of Mount Vernon, N. Y., and since 1904 has been chief electrical engineer for that company. In 1905 he was made vice-president and general manager of the Northern Westchester Lighting Company and also vice-president and general manager of the Peekskill Lighting & Railroad Company, which positions he holds at the present time. Mr. Wilder is a member of the Engineers' Club, of New York City, and a former vice-president of the New York State Railways Association.

MR. JOHN M. ATKINSON has resigned as chairman of the Public Service Commission of Missouri, and will engage in the general practice of law in St. Louis. Mr. Atkinson will specialize in rate, valuation and reorganization cases and all other matters affecting public utilities before public service commissions and the Interstate Commerce Commission.

OBITUARY.

MR. R. E. NOYES, an instructor in electrical engineering at Pratt Institute, Brooklyn, N. Y., for the past seven years, who moved to Pittsfield, Mass., last June to escape the infantile paralysis epidemic, was stricken with the disease and died October 18.

MR. CHARLES W. HOTCHKISS, president of the Richmond Light & Railroad Company, Staten Island, N. Y., died at Battle Creek, Mich., October 28, aged 54 years. He was also president and a director of the Chicago (Ill.) Utilities Company and chairman of the board of directors of the Virginian Railway Company.

CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

BINGHAM, ME.—It is reported that the Central Maine Power Company plans to build a large dam at this place. An excellent waterpower, on the Kennebec River, is to be developed, the dam to form a large reservoir which will impound the water and provide against shortage in drought seasons.

PORTLAND, ME. — The Cumberland County Power & Light Company announces a reduction, effective November 1, in residential lighting rates to 8 cents per kilowatt instead of 8.5 cents. The company is extending its transmission lines to the towns of Gray, Cumberland Center and West Cumberland.

ANTRIM, N. H.—The Antrim-Bennington Electric Light & Power Company has been incorporated with a capital stock of $150,000, to generate and supply electricity in this locality. The incorporators are Louis N. Wheelock, Brookline, Mass.; Joseph C. Bogue, Watertown, Mass., and Paul H. Hammond, West Medford, Mass.

SALISBURY, VT.—Active work of construction by the Addison Electric Power Company, which has lately taken over property of the Kingsley Wood Pulp Company, and plans to build a 1,750-kilowatt generating station, is well under way. I. M. Frost, of Rutland, is president and Edward Lawrence treasurer of the new company. Loren Bugbee, for five years manager of the pulp concern, is in charge of the construction.

WEYMOUTH, MASS.—The Weymouth Light & Power Company is making extensions to its distribution system.

HARTFORD, CONN.—The Hartford Electric Light Company is considering plans for extensive improvements to its generating station at Dutch Point, the work to be started next year. The addition of a 10,000-kilowatt turbogenerator with auxiliaries and additional switchboard equipment is contemplated.

JORDAN, N. Y.—Negotiations for the purchase of the Jordan Electric Light & Power Company by F. W. Knapp, owner of the Marcellus Light Company, have practically been completed. If the deal is made this city and also Elbridge will be supplied with energy from Niagara Falls, for which purpose a transmission line will be erected from Marcellus.

SCHENECTADY, N. Y.—The Schenectady Illuminating Company has increased its capital stock from $3,000,000 to $5,000,000. A number of plant improvements are contemplated.

WALTON, N. Y.—Consolidation of the Colliers Light, Heat & Power Company, the Deposit Electric Company, the Hartwick Power Company and the Southern New York Power Company with the Southern New York Power & Railway Company has been authorized in a series of orders made by the Public Service Commission. The consolidated properties will be largely extended and improved throughout the territory in Otsego, Herkimer, Montgomery, Schoharie and Delaware counties where they are now operating. Transmission lines will be built between the different cities and a number of new localities will be served with electricity.

HIGHTSTOWN, N. J.—The Electric Light & Power Company is building a new transmission line from Trenton to Hightstown for increased local service.

AMITYVILLE, PA.—The Amityville-Stowe Electric Railway Company has been chartered to operate an electric railway between Amityville and Stowe. The capital stock is $50,000, and it is reported that Peoples Brothers, Inc., of Philadelphia, are interested in the project.

BETHELEHEM, PA.—The Bethlehem Steel Company will build a new engine and generator plant at its steel works at Sparrows Point, Md.

BUTLER, PA.—The power and electrical operating plants of the Standard Steel Car Company were destroyed by fire October 29, with a loss estimated at $500,000. The plants will be rebuilt.

CHAMBERSBURG, PA.—Effective November 1, the Cumberland Valley Utilities Company, recently incorporated with a capital of $3,500,000, by Hambleton & Company, New York City, and associates, has assumed control of the following Pennsylvania utilities: Chambersburg, Green Castle & Waynesboro Traction Company; Waynesboro Electric Light Company; Waynesboro, Green Castle & Mercersburg Turnpike Company; Waynesboro Gas Company; Green Castle Light & Power Company, Shippensburg Electric Light Company, Shippensburg Gas Company, Chambersburg & Shippensburg Traction Company, and the Shippensburg Water Company. The new company is planning the installation of electric-lighting systems at Mercersburg, St. Thomas, Fayetteville and other places in Franklin County, and extensions in the traction system to provide a through line to Washington, in connection with the company's traction lines at Hagerstown and Frederick, Md.

CHESTER, PA.—The Beacon Light Company, a subsidiary of the Philadelphia Electric Company, has awarded a contract to the Chester Construction & Contracting Company for the erection of a new six-story, reinforced concrete power plant, about 300 by 420 feet, at a cost of $2,500,000.

ELMORE, PA., The Bakertown Light Heat & Power Company has been incorporated with $5,000 capital stock by A. W. Evans and others, of Ebensburg, to furnish electric service in this locality.

HARRISBURG, PA.—The Public Service Commission has approved the merger of the Alburtis, Hellerstown, Topton, Myers, Freemansburg, Halcyon and Bethlehem electric companies into the Lehigh Valley Light & Power Company, Allentown.

HAZELTON, PA.—The Louis Roessel Company will build a one-story power plant at its silk mill.

JOHNSTOWN, PA.—The Dale Light, Heat & Power Company, of which L. H. Mountney is vice-president and general manager, is preparing plans for improvements which include the installation of new engine and generating equipment and the extenson of its distribution lines into the borough of Lorain and part of Johnstown.

PHILADELPHIA, PA.—The Philadelphia & Suburban Gas & Electric Company is having plans prepared by Lawrence V. Boyd, architect, for a new building to be erected at Jenkintown.

PHILADELPHIA, PA.—The Northern Liberty Gas Works will make alterations and improvements in its engine and boiler plant.

PHILADELPHIA, PA.—The Misericordia Hospital has awarded a contract for the erection of a new power plant on Fifty-fourth Street to John McShain, contractor.

SCRANTON, PA.—The United Service Company, of this city, has recently ordered a 5,000-kilovolt-ampere Curtis turbogenerator for the Ohio Service Company, a subsidiary company, which operates in Coshocton, New Philadelphia and other Ohio cities. The former company has also placed an order for a 2,500-kilovolt-amnere Curtis turbogenerator for the Warren (Pa.) Light & Power Company, the necessary boiler and other equipment to be purchased later. J. H. Conklin is general manager of the United Service Company.

CHARLESTON, W. VA.—The Charleston Interurban Railroad Company will extend its lines from Cabin Creek to Montgomery, a distance of 10 miles. W. E. Carlton is president of the company.

IAGER, W. VA.—The Iager Water, Light, Power & Development Company has been incorporated with a capital of $25,000.

MANNINGTON, W. VA.—The Monongahela Valley Traction Company has purchased the holdings of the Consumers Electric Light Company, of this city, and took possession November 1. The former company has decided to construct a transmission line from its substation at Farmington to this city so that energy may be supplied from the central power station at Hutchinson.

BETHEL, N. C.—The City Council contemplates the reconstruction of the electric-lighting plant which was destroyed by fire recently.

SPRAY, N. C.—Marshall Field & Company has awarded a contract to the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., for electrical equipment for its mills at this place. The contract will amount to about $80,000.

WILMINGTON, N. C.—The Tidewater Power Company is making an extension to its boiler room and installing a new boiler.

STUART, FLA.—George W. Parks and associates are making plans for a development of a hydroelectric plant near here.

NORTH CENTRAL STATES.

AKRON, O.—Bonds to the amount of $19,000 have been voted for the erection of an electric-lighting plant and for new pumps for the water-works system.

CANTON, O.—An ice and storage plant to cost $75,000, with an ice-producing capacity of 50 tons a day and storage of 4,000 tons, is being planned by the Schory & Schelihase Coal & Ice Company, which has been incorporated by Herbert H. Schory and others. The plant is to be completed by January 1.

SANDUSKY, O.—A plant is to be equipped here for the Matthews Engineering Company for the manufacture of electric-lighting plants. The company has been located at Port Clinton, O., but has made arrangements to move to Sandusky.

TIFFIN, O. — The City Council has awarded a 10-year contract to the Ohio Light Power Company for lighting the city streets. The installation of nitrogen-filled incandescent lamps will be made.

TOLEDO, O.—Toledo Railways & Light Company has placed an order for a 20,000-kilowatt turbogenerator, bringing the capacity of its generating stations up to 85,000 kilowatts. The installation of this turbine will mean that in three years the generating capacity of the Toledo Railways & Light stations has been increased five times, as in 1913 the company had but 17,000 kilowatts of generating capacity. In 1915 a 20,000-kilowatt generator was installed, and it is probable that within a few months an order for another will be placed, as the one just ordered will care for the increased energy demand but a short time.

CLINTON, IND.—The Wabash Valley Electric Company has been incorporated with a capital of $250,000 to supply electricity in Clinton, Sullivan, Shelburn, Farmersburg, Jasonville, Hymera, Coalmont and other towns in this section. The directors of the new company are H. C. Dies, J. W. Robb and M. V. Robb.

WHEATLAND, IND.—The Wheatland Light Company has been incorporated with a capital of $2,000 to furnish heat, light and power here. A. C. Nicholson is manager of the company.

LA SALLE, ILL.—The Citizens Lighting Company, a subsidiary of the Illinois Traction System, is planning to make a number of extensions to its plant in this city.

LOVINGTON, ILL.—The Village Board is making plans for improvements to the local electric-lighting system.

NASHVILLE, ILL.—J. A. Steinhauser has sold the local lighting and ice plants to the Saline Electric Company, which has acquired plants in Southern Illinois towns with the intention of building up an extensive transmission system.

CHEBOYGAN, MICH.—The Cheboygan Electric Lighting & Power Company plans a first-mortgage bond issue, the proceeds to be used for increasing its hydroelectric development on Black River so the company can take care of additional business. It is planned to extend its transmission lines to the towns of Petoskey and Harbor Springs and furnish service.

ESCANABA, MICH.—The Board of Public Works is planning extensions to the local electric-lighting system.

MULLIKEN, MICH.—A special election will be called to vote on the question of issuing an electric franchise here. J. H. Henskey has offered to install a plant if given a franchise.

PORT HURON, MICH.—Representatives of the Port Huron Light & Power Company are conferring with the City Commission relative to a new contract for lighting the city streets. The utility company proposes to install nitrogen-filled lamps to replace the present arc-lamp system.

ALLENTON, WIS.—The local electric-lighting company has been sold to a large utility company operating in this section, which also has purchased the plants at Theresa and Elmira. The transmission lines are being erected to the latter two towns and probably will be extended to Allenton.

CAMPBELLSPORT, WIS. — The Wisconsin Gas & Electric Company, of Kenosha, has filed an application with the Railroad Commission for authority to issue $6,500 in stock and $7,500 in bonds for the purpose of acquiring the property of the Campbellsport Electric Light & Power Company.

CHETEK, WIS.—The Railroad Commission has granted permission to the Chetek Light & Power Company for authority to issue $12,500 of stock, $20,000 of bonds and $3,000 of notes for the purpose of acquiring the electric plant and distribution system located in the village of Chetek. W. J. Gavin is general manager of the company.

GRESHAM, WIS.—A franchise has been granted to the Gresham Electric Light & Power Company for the construction of an electric-lighting plant here.

JACKSON, WIS.—The Jackson Electric Light & Power Company is planning to purchase the electric-lighting plant now owned by the Froelich Mercantile Company.

RANDOM LAKE, WIS.—The Random Lake Electric Company is planning the erection of a local electric-lighting system. T. M. Bowler, of Sheboygan, is interested in the company.

REESEVILLE, WIS.—The Wisconsin Gas & Electric Company has purchased the holdings for the Reeseville Light & Power Company and the Marshall Electric Company and will extend to this city the transmission line now being erected to Clyman. The extension to Reeseville will be completed this fall, according to an announcement made by A. C. Babson, manager of the Watertown and Fort Atkinson divisions of the company.

STEVENS POINT, WIS.—The Wisconsin Valley Electric Company, of Wausau, has purchased the local electric-lighting plant and will extend its transmission lines to this city.

WHITEWATER, WIS.—The city is planning the installation of an ornamental electric lighting system in the business district.

ELY, MINN.—The Kawishiwi River Power Company has been organized to construct a hydroelectric power plant. Thomas W. Orbison, Appleton, Wis., has charge of the plans.

GARY, MINN.—Electric service for this place will be furnished from the plant at Canby.

MORTON, MINN.—A 15-year franchise has been granted to the Northern States Power Company to furnish electric service here.

NEW ULM, MINN.—The city contemplates making a number of extensions to the electric-lighting system.

OAK PARK, MINN.—The Northern States Power Company is erecting a new substation here.

ROCHESTER, MINN.—Plans are being prepared for the extension of St. Paul Southern Electric line to Rochester and then to Cresco, Iowa. E. C. Hackett, of this city, is in charge of the plans.

LONE ROCK, IOWA.—The Lone Rock Electric Light Company is planning the erection of a new power house building.

MOUNT VERNON, IOWA.—The Wapsie Power & Light Company, of this city, has completed arrangements for the extension of its transmission lines to West Branch, a distance of about 30 miles. Kenneth Lindsay is manager of the local company.

KENNETT, MO.—The electric light and power plants in Kennett, Caruthersville and Hayti, in Missouri, and Rector, Blytheville and Piggott, in Arkansas, comprising the Missouri and Southeastern Utility Company have been sold to J. H. Watkins of New York City. It is understood that the sale of the property will not affect the management or the operation of the plants.

SEDALIA, MO.—The Sedalia Light & Traction Company has applied to the Public Service Commission for authority to issue $29,400 in securities in which to reimburse the company for betterment expenditures. Additional improvements are planned.

DATES AHEAD.

American Mining Congress. Hotel La Salle, Chicago, Ill., November 13-18. Secretary, J. F. Callbreath, Denver, Colo.

Southeastern Section, N. E. L. A. Annual convention, Tampa, Fla., November 15-17. Secretary, T. W. Peters, Columbus, Ga.

Electric Power Club. Hot Springs, Va., November 15-18. Secretary, C. H. Roth, 1410 West Adams Street, Chicago, Ill.

Ohio Society of Mechanical, Electrical and Steam Engineers. Annual meeting, Columbus, O., November 16. Secretary, F. E. Sanborn, Ohio State University, Columbus, O.

United States Independent Telephone Association. Annual convention, Hotel La Salle, Chicago, Ill., December 5-8. Secretary, W. S. Vivian, 19 South La Salle Street, Chicago, Ill.

Kansas Public Service Association. Annual meeting, Topeka, Kans., December 7-8. Secretary, E. A. Wright, Manhattan, Kans.

American Association for the Advancement of Science. Annual meeting, New York City, December 26-30. Permanent secretary, L. O. Howard, Smithsonian Institution, Washington, D. C.

American Institute of Chemical Engineers. Annual convention, New York City, January 10-13, 1917. Secretary, J. C. Olson, Cooper Union, New York, N. Y.

New Mexico Electrical Association. Annual convention, Albuquerque, N. M., February 12-14. Secretary pro tem, E. A. Thiele, Roswell, N. M.

HAYS, KANS.—The Hays Electric Light & Power Company has asked for a new franchise here. It is possible that the city will vote to take over the plant and operate it.

HIAWATHA, KANS.—Plans have been completed for the installation of an additional generating unit in the local electric-lighting plant and to furnish service to the town of Highland.

CORTLAND, NEB.—A committee has been appointed to secure estimates for the installation of a municipal electric-lighting system.

DUNBAR, NEB.—The erection of an electric-lighting plant here is being planned. W. W. Anness is interested in the plans.

STELLA, NEB.—The Continental Gas & Electric Company has started the work of rehabilitating the local electric-lighting plant which it recently purchased.

HARTFORD, S. D.—The Hartford Light & Power Company is making a four-mile extension to its distribution system to serve Colton and Huntimer Siding.

BISMARCK, N. D.—There is a possibility that a new electric light and power company will be organized in this city and also that a central heating plant capable of taking care of the increasing demand will be organized. A franchise granted for light, heat and power by the City Council is still in existence and a number of business men are planning on taking it over and erecting a plant.

JAMESTOWN, N. D.—The Western Electric Company, which is making numerous plant extensions, has called a meeting of stockholders for December 6 to consider the proposition of issuing $50,000 in first-mortgage bonds.

SOUTH CENTRAL STATES.

ALEXANDRIA, KY.—A small electric-lighting plant and distributing system for the town will be constructed at once by the Alexandria Public Service Company, of which James Gosney is president.

KENTUCKY, KY.—The Kentucky Traction & Terminal Company has purchased a 4,000-kilowatt turbogenerator, according to F. W. Bacon, vice-president and manager. This will be installed in the local plant and will supplement the two 2,500-kilowatt generators now in use. The power plant serves not only the electric railway, but the Lexington Utilities Company, which recently obtained a new franchise from the city.

MORGANFIELD, KY. — The Kentucky Utilities Company, Harry Reid, of Lexington, Ky., president, has placed an order for additions to the generating equipment of the lighting plant and will build a transmission line to Uniontown, where it recently purchased the electric-lighting plant.

ARLINGTON, TENN.—Bids for the construction of an electric-lighting plant and water works system are being received this week. The estimated cost of the plants is $10,000.

NASHVILLE, TENN.—The St. Thomas Hospital will build a brick power house, to cost about $22,000.

DUMAS, ARK.—The board of directors of improvement district No. 1 has advertised for bids for the sale of $15,000 worth of bonds for the construction of an electric-lighting plant.

HEBER SPRINGS, ARK.—The Arkansas Hydroelectric Company has purchased the holdings of the Heber Springs Light & Power Company. The new management will install new generating equipment and furnish 24-hour service. According to A. R. Amos, president of the company, the purchase of the local plant is a preliminary step to the building of the proposed hydroelectric plant on Little Red River north of this city and which is estimated to cost $2,000,000. The ground has been surveyed and plans drawn for the proposed dam. The company proposes to furnish electrical energy for light and power in Pangburn, Searcy, Judsonia, Bald Knob, Beebe, Lonoke and neighboring cities.

IMBODEN, ARK.—The Walnut Ridge Light & Power Company is erecting a transmission line to this city, a distance of about nine miles, to furnish energy for street lighting and commercial use.

AUSTIN, TEX.—The City Commission will extend the municipal ornamental lighting system to a number of additional residence streets.

BERTRAM, TEX.—Elias Allen will build an electric light and power plant here.

DALLAS, TEX.—It is authoritatively announced that as soon as the franchise matters now pending here are settled the Southern Traction Company will proceed with its plans for extending its interurban electric railway from Waco south to Austin, a distance of about 100 miles.

DE KALB, TEX.—Louis H. Fuller, of Houston, has been investigating the situation here with the view of building an electric light and power plant.

EL PASO, TEX.—Plans are being considered for the installation of an ornamental street-lighting system here.

GALVESTON, TEX.—The City Commission plans to extend the street-lighting system to the alleys in the business district.

GONZALES, TEX. — The Guadalupe River Power Company will have soon finished the construction of a large dam across the Guadalupe River near Gonzales and will proceed with the installation of a hydroelectric plant.

LIVINGSTON, TEX.—The Livingston Light & Power Company is installing new machinery in its plant here. A. J. Sloan is manager.

SAN ANTONIO, TEX.—The water power committee of the Manufacturers' Club is negotiating with large investment interests with the view of bringing about the construction of a hydroelectric plant at some point within convenient transportation distance of this city. It is stated that an investigation disclosed that 100,000 horsepower could be disposed of to local manufacturing plants and other consumers here. Surveys have been made which show that hydroelectric power sites are available at various points on the Colorado River, Guadalupe River and Devil's River, and that the power could be delivered to the city limits at a cost of 0.8 cent per kilowatt-hour, and to the individual factory or consumer at a cost of 1.5 to 2 cents per kilowatt-hour. The water power committee is headed by N. M. Karney.

WESTERN STATES.

BUTTE, MONT.—Articles of incorporation have been filed by the Intermountain Power Company. The object of the corporation is to develop water power in Montana and other states, and to sell the power so developed. The principal office is to be in Butte and the life of the corporation is fixed at 40 years. The capital stock is $500,000 in 5,000 shares of $100 each. The incorporators are C. F. Kelley, Charles J. Kelly, John Gillie, L. O. Evans and Eugene Carroll. Directors of the new company stated that plans are not in shape for a more detailed announcement of the plans and prospects of the concern. The location of the power sites was not announced.

FROID, MONT.—The Froid Electric Light & Power Company is preparing to make improvements to its plant. The installation of a 20-horsepower engine will be made.

MOORE, MONT.—The Montana Power Company contemplates improvements and extensions to its local power system.

BOISE, IDAHO.—The Project Mutual Telephone Company has filed application to extend its telephone and lighting systems in Rupert and over the Minidoka project.

FILER, IDAHO.—The Public Utilities Commission has granted the Idaho Power Company permission to construct an electric-lighting system in this city.

HAILEY, IDAHO.—The Idaho Exploration Company is planning the erection of a power plant to serve its Black Barb mines in the Kelly Gulch section.

POCATELLO, IDAHO.—In regard to the installation of a municipal electric-lighting plant, the committee appointed by the City Council to investigate the proposition of Joseph Burns reports that the proposed site is feasible for a power plant of a capacity of 200 kilowatts.

CAMAS, WASH.—Residents in the Oak Park district are planning the installation of an electric street-lighting system.

EPHRATA, WASH.—The City Council is making plans for the installation of an electric street-lighting system in the business, the type of lamp and lighting fixtures to be decided.

EVERETT, WASH.—The Washington Utilities Company, which recently took over the holdings of the Jim Creek Water, Light & Power Company, has been granted a franchise to construct an electric power line along the county road from Norman to Stanwood. The cost of the work is estimated at $15,000.

PE ELL, WASH.—W. F. Shepherd has purchased the interest of L. A. Webb in the Central Light & Manufacturing plant and plans extensive improvements.

PORT ANGELES, WASH.—The bid of Charles S. Kidder & Company, of Chicago, for the $25,000 worth of electric light bonds offering a premium of $1,025 was accepted. The bonds are required to retire warrants and provide for the extension of the lighting system.

ROY, WASH.—George A. Avery has made application to the Public Service Commission for permission to install electric transmission lines near Dupont.

SEATTLE, WASH.—The City Council is considering a bill providing for the purchase of a completely developed power plant and site not exceeding $3,000,000. The bill authorizes the Board of Public Works to let a contract for the construction of a hydroelectric plant, including transmission lines, as an extension of the existing city power and light plant. The bill was referred to the utilities and finance committees. Bills for the construction of an addition to the auxiliary steam power plant at Lake Union at a cost of about $350,000 and the condemnation of the Snoqualmie power plant and city light and power distribution system of the Puget Sound Traction, Light & Power Company will be introduced in the City Council soon.

SPOKANE, WASH.—A petition is being circulated in an effort to secure an ornamental lighting system on Howard Street.

SUNNYSIDE, WASH.—The City Council has awarded a ten-year street-lighting contract to the Pacific Power & Light Company. The agreement provides for the installation of a new series lighting system of latest improved type.

WENATCHEE, WASH.—E. H. MacDaniels, forest supervisor, has applied to the Chelan County Commission for a franchise to operate a telephone line over roads in that county.

MYRTLE CREEK, ORE.—Citizens here have voted bonds for $27,000 for improvements in the municipal light and water plants. A hydroelectric power plant is planned on the South Umpqua River.

RIDDLE, ORE.—Bonds in the sum of $21,000 have been issued to provide for the installation of a municipal lighting system in connection with the water-works system.

THE DALLES, ORE.—The City Council has awarded a ten-year street-lighting contract to the Pacific Power & Light Company. The present system will be rebuilt to provide for an improved lighting service.

HOLLYWOOD, CAL.—The contract for installing ornamental lights on Hollywood Boulevard between Cherokee and Wilcox Avenues has been awarded to the F. S. McEwan Electrical Company of Santa Monica.

LONG BEACH, CAL.—The Molander Power Company has started work on the construction of a $25,000 plant at the end of the Long Beach pleasure pier to produce electric power from wave-motor equipment.

LOS ANGELES, CAL.—It is expected work will commence soon on the installation of ornamental lighting posts along the road up Mt. Washington as advocated by the Mt. Washington Improvement Association.

LOS ANGELES, CAL.—The City Council has ordered the installation and maintenance of the necessary ornamental lighting posts and appliances for lighting Fifty-fifth Street between Budlong and Normandie Avenues.

MODESTO, CAL.—Plans have been received by Manager E. Garner for improvements in the local telephone system to cost about $10,000. New lines will be constructed from Modesto to Oakdale, Empire and Hughson, and the open wire work on Needham Avenue will be replaced with lead-covered cable.

RIALTO, CAL.—It is understood work will start at once under the direction of McMeen & Miller, Chicago engineers, on the construction of a power plant to supply Rialto, Fontana and vicinity with electricity.

SAN DIEGO, CAL.—The San Diego Electric Railway Company contemplates the erection of a substation at Chula Vista.

SAN FRANCISCO, CAL.—The Pacific Gas & Electric Company has filed with the Railroad Commission an application for authority to use the proceeds which it has on hand from the sale of its general and refunding mortgage gold bonds and its first preferred stock, and any other proceeds it may receive from the sale of its first preferred stock, to reimburse its treasury $1,068,804 for expenditures up to September 1, 1916, from income for the improvement and betterment of its plant, and such other sums as have been expended from August 31. The company contemplates an expenditure of $3,150,000 in further improvements. Of this sum, $150,000 will be for betterments of its electric system, $1,000,000 for enlarging its gas department, $250,000 for the water department, $250,000 for railways and $25,000 for the steam sales department.

SAN FRANCISCO, CAL.—The Sierra & San Francisco Power Company has been authorized by the Railroad Commission to issue $1,000,000 face value of its first-mortgage five-per-cent 40-year gold bonds, under its supplemental indenture of first mortgage, dated July 27, 1910. The bonds are to net not less than 85 per cent of par, and the proceeds are to reimburse the company for expenditures in the construction of its generating and distributing systems. The company has spent from May 1, 1913, to August 1, 1916, the sum of $1,272,087 for these improvements. New expenditures are authorized as follows: $100,000 for the completion of Strawberry dam, $500,000 for enlargement of its San Francisco plant, $150,000 for extension of distribution lines, and $100,000 to buy new properties. There are now before the United States government the applications of the company for authority to extend the scope of its hydroelectric operations along the Stanislaus and the branches of that California River. The company's properties now consist of a main hydroelectric plant on the Stanislaus River and other electric plants at Phoenix, Tuolumne County, and Knights Ferry, Calaveras County, with two steam generating plants in San Francisco. The total capacity of its plants is 58,575 kilowatts.

SAN LUIS OBISPO, CAL.—The Midland Counties Public Service Corporation, which is a subsidiary company of the San Joaquin Light & Power Company, is about to begin extensions of its service into certain parts of San Luis Obispo and Santa Barbara counties which will cost about $300,000.

TULARE, CAL.—The City Trustees have called for bids for the installation of an electrolier lighting system.

WATTS, CAL.—At a recent meeting of the Board of Trustees it was decided to install electroliers on East Albert Street.

SEWARD, ALASKA.—The Seward Electric Company is building a new generating plant. A new transmission and distributing system will be installed for local service.

Financial Notes

The Elmira Water, Light & Railroad Company has applied to the Public Service Commission for authority to issue $222,000 five-per-cent fifty-year gold bonds under its first consolidated mortgage.

The Reading Transit & Light Company, Reading, Pa., has issued a statement showing gross earnings of $232,026 for September, an increase of $41,034 over the corresponding month of last year. The total excess for the first nine months of 1916 over same period last year is $343,869.

The Selma (Cal.) Light & Power Company has applied to the Superior Court for an order of dissolution. The company is incorporated for $100,000, and the petition states that practically all of the stock is held by the directors, who are Edwin Dudley, R. C. Gibbs, T. B. Matthews, W. H. Shafer and H. A. Hansen.

Ithaca Gas & Electric Corporation has been authorized by the up-state New York Public Service Commission to purchase 2,000 shares capital stock of Norwich Gas & Electric Company for $200,000; the 2,276 shares of stock of the Oneonta Light & Power Company for $227,600; and the 1,474 shares of stock of the Homer & Cortland Gas Light Company for $147,400. Ithaca Gas & Electric Corporation, after consolidating the three properties, will extend and improve them, connecting their lines to its own high-tension transmission system.

July, the first month of the present fiscal year of the Consolidated Gas, Electric Light & Power Company of Baltimore, showed an increase in output of electricity of 53 per cent over a year ago, August, an increase of 47 per cent and September an increase of 40 per cent. Electric output October 18 was the highest in the company's history. Electric output in 1916 was four times as great as in 1910, and predictions are made that it will be easily doubled within three years. Belief that the dividend will be increased from seven to eight per cent annually is based on this rapid growth.

The Utah Power & Light Company has filed at the Maine department of state a certificate of increase of capital stock from $45,000,000, divided into 450,000 shares of the par value of $100 each, to $60,000,000, divided into 600,000 shares of the par value of $100 each. The fee which the corporation was obliged to pay for this change was $1,505. This makes the Utah Power & Light Company among the largest of the corporations organized under the laws of Maine. Two only are capitalized for a greater amount, the United States Smelting, Refining & Mining Company, capitalized at $75,000,000, and the Tennessee Railway, Light & Power Company, capitalized at $70,000,000. There are but two corporations besides the Utah Power & Light Company having a capitalization of $60,000,000, the Brazil Railway Company and the Commonwealth Power, Railway & Light Company.

Cities Service Company has proposed a charter amendment to its stockholders, which, if carried, will put the preferred stockholders on a more solid basis. The investment of preferred stockholders is backed by excess earnings which represent several times the total dividend requirements on the total amount outstanding. In addition, the proposed charter will give them double this protection. This had always been the annuonced policy of the Cities Service Company, which, however, was subject to change by subsequent boards of directors. Consequently, it was thought better to amend the charter and make this policy a legal obligation, though this action in no wise affects the announced stock dividend policy for the common stockholders. The method of

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Nov. 6	Oct. 30
American Telephone & Telegraph (New York)	133	133⅛
Commonwealth Edison (Chicago)	145	145
Edison Electric Illuminating (Boston)	230	230
Electric Storage Battery common (Philadelphia)	71⅞	69
Electric Storage Battery preferred (Philadelphia)	71⅞	69
General Electric (New York)	182	181¼
Kings County Electric (New York)	129	129
Massachusetts Electric common (Boston)	4½	4¾
Massachusetts Electric preferred (Boston)	32	33
National Carbon common (Chicago)	295	268
National Carbon preferred (Chicago)	....	....
New England Telephone (Boston)	128	128
Philadelphia Electric (Philadelphia)	29¼	29⅜
Postal Telegraph-Cables common (New York)	86½	86⅝
Postal Telegraph-Cables preferred (New York)	66½	66½
Western Union (New York)	102	102½
Westinghouse common (New York)	65¾	63⅞
Westinghouse preferred (New York)	73	70

strengthening the stability of the Cities Service preferred stock will be to reinvest all earnings in excess of the six-per-cent dividend on the common stock.

Dividends.

	Term	Rate	Payable
Pac. Gas & Elec., first pf.	Q	1.5 %	Nov. 15
Pac. Gas & Elec., orig. pf.	Q	1.5 %	Nov. 15
Tampa Elec.	Q	2.5 %	Nov. 15
West. States Gas & Elec., com.	Q	0.5 %	Nov. 15
White (J. G.) Eng. Corp., pf.	Q	1.75%	Dec. 1
White (J. G.) Inc., pf.	Q	1.5 %	Dec. 1
White (J. G.) Manage., pf.	Q	1.75%	Dec. 1

Reports of Earnings.

AMERICAN LIGHT & TRACTION COMPANY.

American Light & Traction Company reported income account for the year ended September 30, 1916, as follows:

	1916	1915
Income from stocks of subsidaries owned	$5,184,616	$4,239,114
Miscellaneous earnings	573,076	745,940
Gross income	5,757,692	4,985,054
Expenses and taxes	199,759	156,620
Net income	5,557,933	4,828,434
Preferred dividends	854,172	854,172
Common dividends, cash	1,757,992	1,592,365
Common dividends, stock	1,757,992	1,592,365
Surplus	1,187,776	789,574
Previous surplus	10,371,970	9,582,438
Total surplus, September 30	11,559,746	10,371,970

BELL TELEPHONE SYSTEM IN UNITED STATES.

September:	1916	1915
Total operative revenue	$22,709,221	$19,939,527
Operating expense	14,976,055	13,187,920
Net operating revenue	7,733,166	6,751,697
Net after taxes	6,278,771	5,543,705
Nine months:		
Total operating revenue	194,317,711	173,424,223
Operating expense	128,544,474	115,510,364
Net operating revenue	65,773,237	57,913,859
Net after taxes	53,864,437	46,984,042
Miles wire owned	19,343,123	18,106,601
Bell stations owned	6,379,088	5,826,842
Total stations	9,663,410	8,976,231

New Incorporations

DETROIT, MICH.—Venus Dry Storage Battery Company. Capital, $26,000. Incorportors: William J. Malloy, Frederick O'Hearn and M. B. Duffield.

WATERTOWN, N. Y.—The No-Glar-On Company. Capital, $100,000. Manufacture electric-light bulbs. Incorporators: A. B. Williams, F. M. Williams and C. G. Willis.

NEW YORK, N. Y.—New Light Electric Company. Capital, $3,000. Electric fixtures, etc. Incorporators: S. Braunstein, H. M. Israel and I. Rachlin, all of Brooklyn.

WHEELING, MO.—The Fuse Electric Fire & Burglar Alarm Company. Capital, $30,000. Manufacture and market fire and burglar-alarm systems. Incorporators: A. E. Lowe, Thomas J. Lilly and W. S. Cherry.

CHATTANOOGA, TENN. — St. Elmo Electrical Company. Capital, $2,000. Buy, sell and install electrical equipment and apparatus. Incorporators: W. A. Jewell, J. W. Lawless and others.

DOVER, DEL.—The United Cable Conductor & Manufacturing Company. Capital, $100,000. To manufacture solderless electric cable connections. Incorporators: Herbert E. Latter and Norman P. Coffin, Wilmington, Del.

INDIANAPOLIS, IND.—The Kilo Electric Meter Company. Capital, $40,000. Manufacture electrical appliances. Incorporators: William J. Malloy and William T. Wann.

NEW YORK, N. Y.—The Electrolytic Works of America. Capital, $500,000. Manufacture electrolytic chemicals under processes discovered by Richard Riordan. Incorporators: F. Frank, H. Wehmann and J. Speth, all of 277 Third Avenue, New York City.

NEW YORK, N. Y.—Fahn-McJunkin Company. Capital, $500,000. To do designing, building, etc., and to deal in electrical machinery and supplies. Incorporators: E. R. Copper, 50 East Forty-first Street, New York City, and R. H. I. Streasau, 31 Washington Street, Brooklyn, N. Y.

Proposals

POWER PLANT CONSTRUCTION.—Sealed bids will be received by the city of St. Cloud, Fla., until December 1, for constructing a waterworks system and power plant. W. A. Ginn, engineer in charge.

DRY CELLS.—Bids will be received at the Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., for furnishing dry cells, under schedule 347, covering an annual supply for delivery at various yards. Bidders desiring to submit proposals should make application to the Bureau or to the nearest navy yard purchasing office.

COPPER WIRE.—Sealed bids will be received November 14, at 406 City Hall, Chicago, Ill., for furnishing and delivering to the city of Chicago at the shafts of the tunnel at Wilson and Clarendon Avenues, 3,000 pounds of copper annunciator wire, according to plans and specifications on file in the office of the Department of Public Works.

CONDUIT AND WIRING.—Sealed proposals will be opened in the office of the Supervising Architect, Treasury Department, Washington, D. C., until November 24, for a new system of conduit and wiring and alterations in heating system in the United States assay office at Boise, Idaho, in accordance with drawings and specifications, copies of which may be had at that office, or at the office of the custodian, Boise, Idaho, in the discretion of the Supervising Architect, James A. Wetmore, Acting Supervising Architect.

LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until November 24, for furnishing and installing lighting fixtures in the United States postoffice buildings at Anoka, Minn.; Antigo, Wis.; Arkadelphia, Ark.; Attleboro, Mass.; Brenham, Tex.; Ellensburg, Wash.; Grand Junction, Colo.; Greenwich, Conn.; Humboldt, Tenn.; Norton, Va.; Ridgway, Pa., and Valley City, N. D. Copies of plans and specifications may be obtained from the office of the Supervising Architect, Washington, D. C.

Electrical Patents Issued October 31, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,202,767. **Spark-Plug.** G. A. Arnold, assignor to Arnold Electric Co., Middletown, Conn. Structural details.

1,202,777 and 1,202,778. **Eddy-Current Tachometer.** W. Beckmann, Berlin, Germany. Arrangement of magnet system and indicator.

1,202,788. **Electrical Measuring Instrument.** W. M. Bradshaw and W. G. Mylius, assignors to Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. Meter gearing.

1,202,793. **Trolley-Wire Support.** J. Bryan, Pittsburgh, Pa. Details of Spanner structure.

1,202,812. **Signal.** J. B. Dengel, Rochester, N. Y. Vehicle lamp showing different colors.

1,202,818. **Metal Carbon Brush.** H. R. Edgecomb, assignor to Westinghouse Electric & Mfg. Co. Mixture of copper and tin shavings with fine graphite is pressed into shape.

1,202,837. **Electric Furnace.** I. Hechenbleikner, assignor to Southern Electro-Chemical Co., New York, N. Y. Structure of walls and water jacket.

1,202,841. **Electric Motor or Generator.** E. A. Haibleib, assignor to North East Electric Co., Rochester, N. Y. Manner of bringing out leads from casing.

1,202,844. **Liquid Supply for Motor Vehicle Cooling Systems.** F. W. Horton, Denver, Colo. Replenishment of supply of fluid electrically controlled by level in cooling system.

1,202,846. **Electric Iron.** T. D. Hurley, Green Island, N. Y. Has provision for vertical support.

1,202,861. **Flaming-Arc Lamp.** G. M. Little, assignor to Westinghouse Electric & Mfg. Co. Structure of inclosing globe.

1,202,870. **Twin-Signal Electric Lamp.** J. M. Meekins, assignor of one-half to W. H. Gahan, Baltimore, Md. For vehicles; structure of push switch.

1,202,880. **Electrically Controlled Motor.** C. I. Murdock, Marshall and H. R. Graf, Jackson, Mich. Mechanism has electromagnetically controlled stop.

1,202,885. **Insulator Pin.** C. I. Pierce, assignor of one-half to Hubbard & Co., Pittsburgh, Pa. Single length of sheet metal of channeled section doubled upon itself.

1,202,895. **Machine Oiler.** G. M. Rogers, Chicago, Ill. Solenoid-controlled feed.

1,202,923. **Electrical Connecting Device.** S. Trood, assignor to Westinghouse Electric & Mfg. Co. Post is engaged by insulation-covered spring clip.

1,202,925. **Automatic Recording System for Radio Time Signals.** F. D. Urie, Elgin, Ill. For comparing time at sending with time at receiving station.

1,202,930. **Anti-Friction Trolley Base.** F. A. Wasson, assignor to Wasson Engineering & Supply Co., Milwaukee, Wis. Special structure with roller bearings.

1,202,952. **Controlling System.** E. W. Adams, assignor to Western Electric Co., New York, N. Y. For controlling two machines acting on a band of material passing between them.

1,202,957. **Electrical Liquid-Heating Device.** E. Baughn, North Yakima, Wash. Structure of electrically heated water-tank.

1,202,996. **Portable Electric-Lamp Dry-Battery.** J. S. Hamilton, London, England. Structure of contacts and casing containing cells.

1,203,004. **Electric Iron.** W. Juniper, Berwyn, Ill., assignor to Gits Electrical Co., Franklin Park, Ill. Has heating unit between face plates of different heat conductivities.

1,203,028. **Motor and Stop Mechanism for Autographic Registers.** A. C. V. Malm, assignor to Egry Register Co., Dayton, O. Motor-control switch is interconnected with mechanism stop.

1,203,030. **Means for Removing Electricity from Paper.** P. Martucci, assignor of one-half to A. J. Frank, Philadelphia, Pa. For attachment to cylinder press.

1,203,035. **Photographic Printing Machine.** A. F. Mueller, Chicago, Ill. Arrangement of lamp and printing plate in foot-operated machine.

1,203,045. **Terminal Fitting for Electric Conduits.** J. C. Phelps, Springfield Mass. Can closing end of conduit and permitting outlet of wires.

1,203,046. **Semi-Indirect Lighting Device.** A. S. Powell, assignor to M. Stransky, Mount Vernon, N. Y. Has shade secured to socket and bowl suspended therefrom. (See cut, next page.)

1,203,049. **Electric Sign.** W. Recke, New York, N. Y. Contact device for simultaneously displaying pictures and script or sketch work.

1,203,064. **Transmitting Apparatus for Wireless Telegraph and Telephone Systems.** F. G. Simpson, Seattle, Wash. Details of charging, trigger and oscillating circuits.

1,203,101. **Shade-Holder.** J. S. Crossley, assignor to Pass & Seymour, Incorporated, Solvay, N. Y. For socket attachment.

1,203,123. **Railway Signaling.** C. H. Lay, assignor to Union Switch & Signal Co., Swissvale, Pa. Block system for governing traffic in both directions on a single track.

1,203,125. **Protective Device for Electric Heaters.** C. C. Nuckols, assignors to Consolidated Car Heating Co., Albany, N. Y. Circuit-breakers governed by excessive heat and current.

1,203,138. **Electrically Driven Percussive Tool.** L. Scholer, Lichterfeldt, near Berlin, Germany. Details of rotary hammer operating motor.

1,203,146. **System of Vehicle Control.** P. J. Simmin, Indianapolis, Ind. Railway block system.

1,203,153. **Shade-Holder.** M. P. Stevens, E. Orange, N. J. For use in connection with a wall socket.

1,203,166. **Semi-Automatic Telephone System.** B. D. Willis, assignor to Automatic Electric Co., Chicago, Ill. Operator is brought in after one subscriber has set up connection with another.

1,203,172. **Apparatus for Measuring or Recording Oscillations, Impulses and the Like.** A. Behm, Kiel, Germany. Tuning fork has steel blade and glass filaments of different periods arranged one above the other with a ball at top for observation and record.

1,203,177. **Cable-Splicing Joint.** D. E. Bostick, Houston, Tex. Details of sheath for splice. (See cut, next page.)

1,203,179. **Electrical Snow-Melting Heater.** J. A. Bowles, assignor of one-half to C. H. Hintz, Spokane, Wash. Snow-melting heaters located along roadway.

1,203,190. **Recording and Reproduction of Pulsations or Variations in Sounds and**

Other Phenomena. C. E. Fritts, assignor to J. D. Myers, Philadelphia, Pa. Comprises variation of electric current in a circuit by varying light falling on light-sensitive receiver in the circuit.

1,203,191. Method and Means for Recording and Reproducing Variations in Light. C. E. Fritts, assignor to J. D. Myer, Philadelphia, Pa. Photographic mechanism for use with the above.

1,203,215. Electrode. C. E. McCollam, assignor of one-half to S. T. McCollam, Emporia, Kan. For arc-lamps.

1,203,218. Automatic Controlling and Stabilizing Mechanism. A. J. Macy, Chicago, Ill. For aeroplanes; comprises a mercury cup with controlling contacts therein.

1,203,219. Automatic Stabilizing Device. A. J. Macy. Modification of above.

1,203,220 and 1,203,221. Stabilizer. A. J. Macy. Modifications of above.

1,203,223. Control Mechanism for Power-Driven Devices. C. M. Manly, Freeport, N. Y. Electrical control of gearing for effecting acceleration on starting and deceleration on stopping.

1,203,230. Regulating Apparatus. G. Mertelmeyer and H. Koester, assignors to the Bristol Co., Waterbury, Conn. Contact mechanism controlled by measuring arm.

1,203,236. Humidity-Controlling Mechanism for Drying Rooms. G. I. Mossiss, assignor to Reliance Drying Room Co., Chicago, Ill. Controlling circuit governed by humidity gauge.

1,203,239. Pay-Station for Telephone Systems. G. E. Mueller, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Details of coin-controlled instrument.

1,203,242. Train-Control Means. W. B. Murray, assignor to Miller Train Control Corp., Staunton, Va. Structural details of electromagnetically controlled mechanism for operating train-control means.

1,203,251. Telephone Attachment. J. C. Olsen, assignor of one-half to P. McArthur, Chicago, Ill. Coin-deposit counting attachment for pay-stations.

1,203,263. Statistical-Card-Verifying Machine. J. Powers, assignor to Powers Accounting Machine Co., New York, N. Y. Lamp control in device for comparing perforated cards.

1,203,264. Spark-Plug. N. T. Quevedo, assignor of 25-100 to Madison Real Property & Security Co., New York, N. Y. Has central electrode moved into connecting position by cylinder pressure.

1,203,266. Alternating Electric Current Rectifier. F. H. Reeves, Pittsburgh, Pa. Commutator device.

1,203,276. Electric Furnace. E. K. Scott, assignor to Atmospheric Nitrates, Manchester, England. Special arrangement of electrodes in apparatus for the fixation of nitrogen.

1,203,279. Dry-Cell. G. L. Tarver, Oakland, Cal. Details of device having cup and cap constituting the positive electrode.

1,203,287. Electrical Switch Mechanism. M. J. Weber, assignor to Ohio Pump & Brass Co., Columbus, O. Structure of quick-break lever switch.

1,203,297. Electromagnetic Vibrator. C. H. Adams, Muskegon Heights, Mich. Has special flexible core.

1,203,307. Frequency-Measuring Instrument. W. H. Bristol and M. J. Johnson, assignors to Bristol Co., Waterbury, Conn. Coils and connections for measuring frequency variations in an alternating circuit.

1,203,316. Oil Fuse. L. W. Downes, Providence, R. I. Fuse on cover is connected in circuit only when cover is locked on receptacle.

1,203,325 and 1,203,326. Telephone Relay or Repeater. E. Grissinger, Buffalo, N. Y., assignor to American Telephone & Telegraph Co. First patent: arrangement of circuits including an artificial line. Second patent: structure of microphone with provision for preventing sympathetic vibration which would distort the speech.

1,203,336. Telephone System. E. E. Hinrichsen, assignor to Western Electric Co., New York, N. Y. Arrangement of trunks for a number of central and local offices.

1,203,343. Insulating Device. D. U. Hughes, assignor to General Electric Co., Schenectady, N. Y. Incandescent lamp has tubular stem, the outer end being closed by an insulating plug separating the leading-in wires.

1,203,347. Dynamoelectric Machine. L. J. Hunt, assignor to General Electric Co. Alternating motor designed to run as a synchronous motor at cascade speed.

1,203,358. Electric Switch Device. C. J. Klein, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Two-push-button snap-switch.

1,203,390. Gathering Apparatus. R. E. Noble, assignor to Morgan-Gardner Electric Co., Chicago, Ill. For mines; arrangement of cable and reels.

1,203,400. Electric Welding Machine. R. C. Pierce, assignor to Toledo Electric Welder Co., Cincinnati, O. Spot-welder.

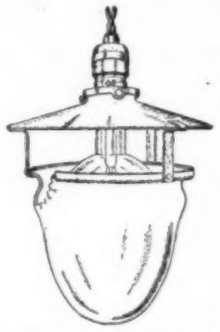
1,203,407. Telephone Exchange System. A. E. Reinke, assignor to Western Electric Co. Arrangement of jacks and link circuits.

1,203,415. Attachment Plug. H. R. Sargent, assignor to General Electric Co. Structural details.

1,203,416. Alternating-Current Generator. P. Sauvage, assignor to Societe Anonyme dite Ateliers de Constructions Electriques du Nord et de l'est, Paris, France. Has construction increasing self-inductance to reduce current on momentary short-circuit.

1,203,420. Alarm Signal. J. Siddall and W. H. Siddall, assignors to New Jersey Electric Protection Co. Alarm box for sending three separate alarms and insuring their proper relationship.

1,203,427. Arc-Lamp. R. G. Standerwock, assignor to General Electric Co.



No. 1,202,046.—Semi-Indirect Lighting Device.

Feeding mechanism for lamp having the lower electrode the movable one.

1,203,433. Arc-Position Device. J. Suchy, assignor to General Electric Co. Structure of arc positioning magnet and adjusting means therefor.

1,203,462. Railway-Traffic Controlling Apparatus. H. S. Beakes, assignor to Union Switch & Signal Co., Swissvale, Pa. Polarized electromagnetic mechanism for operating track switches.

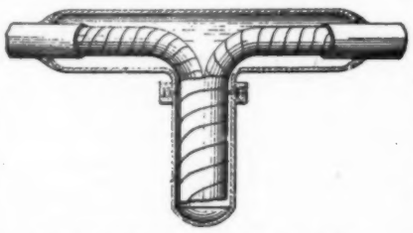
1,203,463. Electromagnetic Device. H. S. Beakes, assignor to Union Switch & Signal Co. For use with the above.

1,203,468. Dynamoelectric Machine. S. R. Bergman, assignor to General Electric Co. Compensated direct-current machine with distributed exciting winding.

1,203,495. Vacuum Tube. W. D. Coolidge, assignor to General Electric Co. For producing X-rays.

1,203,502. Telephone Exchange System. G. Deakin, San Francisco, Cal. Automatic system.

1,203,536. Railway Gate. F. A. Grant, Cortland, N. Y. Motor closing gate against



No. 1,202,177.—Cable-Splicing Joint.

counterweights controlled by train-operated trip rails.

1,203,540. High-Tension and Telephone Line Construction. A. L. Harrington, Raleigh, N. C. Wires strung on slanting crossarms to form helices about the center of the crossarms.

1,203,544. Signaling Device. E. Moard, assignor to Bevin Brothers Mfg. Co., East Hampton, Conn. Horn having motor-operated diaphragm.

1,203,552. Automatic Mechanism for Controlling Electric Cutouts. M. R. Berry, assignor to Electric Products Co., Cleveland, O. Circuit-breaker in consumption circuit is controlled by clock mechanism controlled by indicating meter.

1,203,553. Staple Forming and Feeding Mechanism. C. Bombardie, assignor to Wirebounds Patents Co., Kittery, Me. Staple is magnetically held in position.

1,203,556. Faulty-Cable Localizer. A. Davis, assignor to General Electric Co. Development of fault unbalances magnetic system connected with three-phase mains.

1,203,560. Timer and Distributer. F. C. Hersee, Boston, Mass. For ignition systems.

Reissue 14,208. Original No. 1,175,668, March 14, 1916. Electrical System. R. Varley, Englewood, N. J. Ignition system.

PATENTS EXPIRED.

The following United States electrical patents expired on November 7, 1916:

636,234. Process of and Apparatus for Electrolytic Decomposition of Saline Solutions. E. Baker, Winchester, Mass.

636,241. Method of and Means for Controlling Systems of Distribution. C. A. Brown, Chicago, Ill.

636,244. Portable Igniter Plant. A. W. Crosby, Geneseo, Kan.

636,270. Vacuum Arc Lamp. J. H. Loos, Orange, N. J.

636,275 and 636,276. Signal for Telephone Trunk Lines. F. R. McBerty, Downer's Grove, Ill.

636,277. Apparatus for Inter-Office Trunk Lines. F. R. McBerty, Downer's Grove, Ill.

636,286. Automatic Electric Switch. E. F. Porter, Boston, Mass.

636,299. Trolley. E. G. Solomon, Omaha, Neb.

636,304. Apparatus for Effecting Silent Electrical Discharges. A. Vosmaer, Haarlem, Netherlands.

636,308. Device for Inflating Pneumatic Tires. J. F. Wilson, Jetmore, Kans.

636,313. Means for Controlling Railway Trains. H. Biermann, Breslau, Germany.

636,318. Battery. C. E. Borroughs, New York, N. Y.

636,321. Electrometallurgical Process of Extracting Native Copper. T. Craney, Bay City, Mich.

636,327. Means for Supporting and Bracing Yardarms for Arc Lamps, etc. J. R. Fletcher, Dayton, O.

636,336. Incandescent-Lamp. Holder or Receptacle. G. A. Harter, Chicago, Ill.

636,358. Electric Arc Lamp. R. Schelbauer, Jersey City, N. J.

636,360. Electric Switch. F. Schwedtmann, St. Louis, Mo.

636,366. Telephone System. E. P. Trayer and D. E. Reynolds, New York, N. Y.

636,376. Electric Igniter for Gas Engines. J. S. Blackburn, Salem, O.

636,379. Electric Cutout. J. Erikson, Providence, R. I.

636,415. Toll-Collecting Apparatus for Telephones. H. G. Sweeny, Chicago, Ill.

636,420. Coin-Controlled Mechanism. A. E. Watkins, Jersey City, N. J.

636,429. Electric-Lighting Apparatus for Vehicles. G. Heidel, St. Louis, Mo.

636,453. Electric Igniter for Gas Engines. J. W. Raymond, Oil City, Pa.

636,458. Automatic Magnetic Circuit-Breaker. W. M. Scott, Philadelphia, Pa.

636,486. Electric Circuit-Closer. J. J. Busenbenz, Chicago, Ill.

636,492. Flash Lamp. J. L. Cohen, New York, N. Y.

636,505. Globe-Holder for Electric Lamps. G. W. Eddy, Waterbury, Conn.

636,519. Transmission of Sound. E. Gray, Highland Park, Ill.

636,520. Transmission of Sound and Device for Carrying Same into Effect. E. Gray, Highland Park, Ill.

636,529. Motor Carriage. E. Henriques, Brussels, Belgium.

636,552. Means for Preventing Improper Manipulation of Air Brakes. W. B. Porter and F. E. Case, Schenectady, N. Y.

636,565. Safety Fuse. J. Sachs, New York, N. Y.

636,577. Electric Apparatus. H. W. Smith and W. J. Baughman, Pittsfield, Mass.

636,578. Thermal Cutout. C. P. Steinmetz, Schenectady, N. Y.

636,604. Automatic Railway Signal. J. M. Williams and T. P. Kinney, Danville, and H. W. Kinney, Lynchburg, Va.

636,638. Means for Intercepting Earth Currents in Electrical Traction. W. Cramer, Hagen, Germany.

636,656. Electric Time Alarm. G. E. Frank, Scranton, Pa.

636,676. Sanitary Attachment for Telephone Transmitters. W. Lenderoth, New York, N. Y.

636,685. Weight and Pressure-Recording Apparatus. E. McGarvey, Bellefonte, Pa.

636,695. Burglar Alarm. H. J. Pyle, Pueblo, Colo.

636,704, 636,705 and 636,706. Loom. W. H. Baker, Central Falls, R. I., and F. E. Kip, Montclair, N. J.

636,707. Welt - Supply Mechanism for Looms. W. H. Baker, Central Falls, R. I., and F. E. Kip, Montclair, N. J.

636,721. Advertising Apparatus. W. H. Gilman, Boston, Mass.

Reissue 11,763. Electric Motor. T. Duncan, Chicago, Ill.

Reissue 11,786. Electromagnetic Brake. F. C. Newell, Chicago, Ill.